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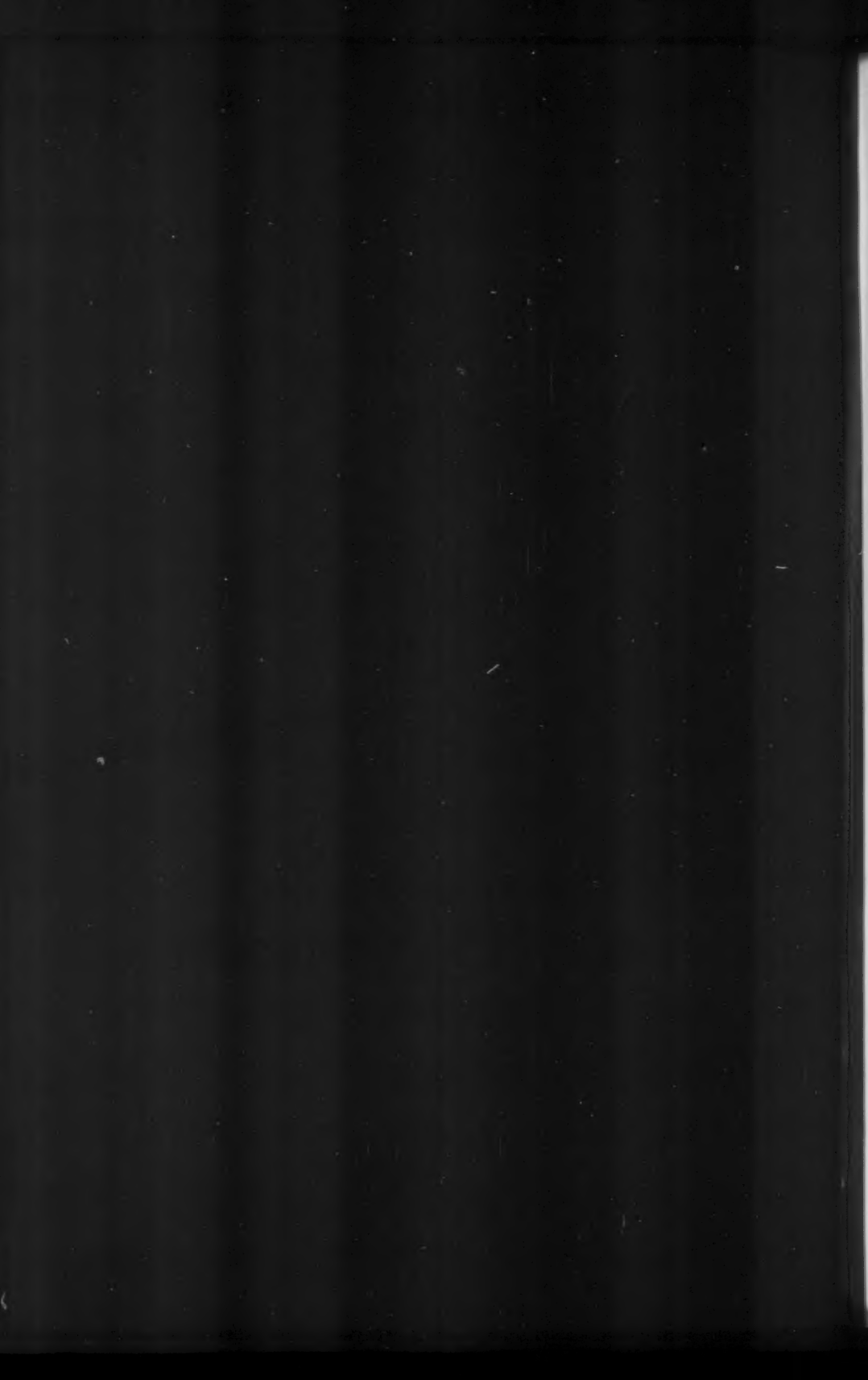
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THE LARYNGOSCOPE.

VOL. LXI

JUNE, 1951.

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PRESIDENT'S ADDRESS.*

LOUIS H. CLERF, M.D.,
Philadelphia, Pa.

One cannot accept the presidency of this Society without an appreciation of the great honor that has been conferred upon him and also a realization of his inadequacy. An understanding secretary and other officers have been helpful in solving the problems of the Society and I am grateful to them.

In a recent address before a group of physicians, General Paul R. Hawley, formerly Medical Director of the Veterans Administration and presently Executive Director of the American College of Surgeons, stated that, after having unusual opportunities for studying the professional activities of physicians in many States, he has regretfully arrived at the conclusion that the confidence of many people has been shaken regarding the unselfishness and the spirit of public service of the members of the medical profession. While we are not entirely unaware of this situation, we, nevertheless, are grateful to Dr. Hawley for his honesty in bringing this to our attention. His observations interested me very much and also suggested that physicians are not unlike the rest of mankind.

It has been generally observed that during the past quarter of this century there has developed a serious and continuing

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deterioration of former moral and ethical standards of behavior in nearly all classes of society in our own land as well as in other countries.

We have been and are living and working in an age which tends to accord undue importance to material interests and forget the urgent need for moral, ethical and spiritual considerations. We are continuously being confronted with the corrupting effects of political influence, intrigue and unethical practices upon our public servants in high as well as in low places. How does the medical profession fare?

No physician regardless of professional experience or position in the medical world can fail to recognize at this time the obligations owed by him to his profession. He should fully realize that he cannot consider himself an isolated individual in the medical world, but rather that he represents an important group and has the ability and opportunity to exercise a potent and an inspiring influence not only on the welfare of his profession but also in his community and his country. To exercise this influence, it obviously is necessary that we be fully aware of our responsibilities and our obligations.

In discussing the responsibilities and obligations of the physician, Dr. Elmer Hess, summarized them as follows: to alleviate suffering; to save life; to advise others of our methods; and, to secure compensation in order to live. I should like to add an additional obligation, namely, that the physician exert his individual influence in a more articulate manner to maintain the profession of medicine at a high ethical and moral level.

We are all in agreement regarding the alleviating of suffering. There should be no question concerning the saving of life. The physician should stay the hand of the Grim Reaper and not lend it aid. At this time the world is supersaturated with fears of war, of atomic bombs, and atomic thoughts, and the various "isms" are shaking the very foundations of our reverence for life. Until we learn more about life and death, it is unwise to consider making life shorter for those who are victims apparently of an incurable disease. We have learned

too well of the terrible crimes perpetrated during World War II by members of our profession who contributed their knowledge and skill presumably in the interests of scientific research and used their brothers as experimental animals. This cannot be attributed entirely to the effects of a totalitarian form of government.

One of the fine things about our profession to which we can lay claim is our unselfish attitude towards a widespread dissemination of knowledge concerning methods and techniques to alleviate suffering and to save life. Our meeting today is an outgrowth of this desire to impart to our colleagues knowledge that we have accumulated concerning diagnosis and treatment.

It is generally recognized but perhaps too often ignored in practice that an important part of education, either academic, technical or professional, is the personal influence of the teacher upon the student. There are many in this audience who are members of the teaching staffs of medical colleges. I wonder if that necessary inspiring influence of the personality and the ethical attitude towards patients is as clearly demonstrated by the teacher to the taught in medical colleges and hospitals now as it was formerly.

The laborer is worthy of his hire. The physician is entitled to secure adequate compensation so that he may live properly. The practice of medicine is considered by many as a trade and those who practice it as tradesmen. Some legal authorities have supported this thesis. This is a recent interpretation fostered by those who would deprive man of his dignity and confer it upon the State; who would usurp human rights and establish a socialistic regimen. It is no secret that there exists an impression on the part of the public, sometimes justified by factual evidence, that certain physicians seem to be a privileged and a not too ethical business group. To have saved a patient's life should not entitle the physician to exact ransom as does a kidnapper. This probably has served to undermine the confidence and esteem once enjoyed by our profession.

I shall always remember the words addressed by William Potter, former Ambassador to Italy, to the graduating class

of one of our leading medical schools: "If there be within the sound of my voice any young man who has entered upon this task without consecration, without noble purpose and without high endeavor, and intends to continue in this heedless manner he had better leave our ranks at once and seek to obtain his chances for worldly success in some easier and more material channel!"

Regarding a more articulate attitude on matters pertaining to medicine, many of us have been ready and willing to allow those outside of our profession to solve these problems for us. Too many have failed to realize that a social revolution has been in progress in this country for several decades and that these changes are irreversible and irrevocable. If aware of it, they have not taken it seriously and have not yet felt the full impact of the changes that have already taken place. There can be little doubt that these will materially alter medical practice. Should we not take a more active part in these changes? If we leave it to the bureaucrats and politicians they will accept the credit for reducing the toll of disease and adding to the life span of man. They will urge us to give up a system which has prolonged human life by 20 years and to accept in its stead a plan which will make human life not worth prolonging.

As Fellows of this Society, we represent a select group who have attained a place of distinction in the field of otolaryngology. This includes many distinguished teachers. This places upon our shoulders additional obligations which we cannot delegate to others. There is need now, as never before, for a sound progressive medical leadership. Dr. Elmer L. Henderson, Past President of the American Medical Association, recently stated that "physicians by their thinking, spirit, and effort, can set an example for government, diplomats, and people everywhere."

The physicians' obligations are to care not only for the immediate ills of their fellowmen but also to aid in solving the social and economic problems involved in providing medi-

cal care for citizens individually and collectively, and, in addition to exert their influence towards the development of good will among their neighbors across the back fence as well as their neighbors half-way round the world.

SYMPOSIUM: CARCINOMA OF THE LARYNX.

I — THE SURGICAL TREATMENT OF EARLY CARCINOMA OF THE LARYNX.*†

FRANCIS E. LEJEUNE, M.D.,
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The major consideration in the surgical treatment of early cancer of the larynx is selection of a method that offers the patient the greatest prospect of cure with the minimum amount of interference with the normal function of that organ. Of course, every laryngologist wishes he could see patients with intrinsic cancer of the larynx as early as it is humanly possible to discover them. This should not be difficult to attain since every case of cancer of the vocal cords makes its presence known by the appearance of vocal changes almost simultaneously with development of the lesion; nevertheless, approximately 30 per cent of patients with cancer of the larynx consulting the laryngologist for the first time have such extensive lesions that little can be done for them. Proper appreciation of the significance of persistent hoarseness by the physician, and by the laity, would reduce this incidence to a figure which would be practically negligible. Like cancer in other parts of the body, the earlier the diagnosis the greater the possibility of cure.

In the treatment of early cancer of the vocal cords, a complete cure is highly possible by two surgical approaches. Each of these is excellent for the type of case for which it was designed and successful results can be expected only if strict adherence to the indications for the use of each is observed. The first of these is intralaryngeal extirpation and the other

*Read as part of a Symposium at the Fifty-fifth Annual Meeting of the American Laryngological, Rhinological and Otolological Society, Inc., Atlantic City, N. J., May 6, 1951.

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is laryngofissure or thyrotomy. The relative indications, merits and results of these two surgical procedures will be briefly discussed.

INTRALARYNGEAL EXTIRPATION.

Experience has proved that in certain cases of cancer of the larynx an intralaryngeal operation can be performed with excellent results, provided certain fundamental requirements are rigidly observed. Occasionally, an early carcinoma is seen on one vocal cord which appears so limited in extent that one wonders whether an operation such as laryngofissure is necessary to eradicate so small a lesion. Such a growth can be successfully eradicated by the intralaryngeal approach, provided it is an early unilateral lesion, of low gradation and completely surrounded by normal appearing tissue. Such a small growth may well be considered a surface lesion. These small surface lesions are slow to infiltrate the surrounding tissue because of the usual low grade of malignancy and the paucity of the lymphatic supply in this area. The growth, which may be only the size of a grain of rice, a pea, or a dimpled match head, is usually located at the junction of the anterior and middle thirds of the vocal cord. If there is any question at all about the lesion being too extensive for intralaryngeal dissection, laryngofissure should be done. Because of the paucity of the lymphatics in the anterior portion of the larynx, the low grade of malignancy and the slow growth, these early surface lesions offer a greater percentage of cures at this stage of development than any other type of malignancy occurring in the larynx. This, then, is the ideal type of case for intralaryngeal extirpation; however, only 6 to 7 per cent of intrinsic cancers of the vocal cord are seen early enough to be suitable for this procedure. Leucoplakia and keratosis of the vocal cords, now being seen with greater frequency than formerly, are also indications for intralaryngeal extirpation. These lesions are precancerous and although repeated biopsies may show them to be benign, eventually they will become cancerous if not treated. For this reason we believe that intralaryngeal extirpation is indicated for

leucoplakia of the cords of limited extent. To postpone treatment in order to watch developments of such growths is to invite trouble.

Successful extirpation of these highly selective lesions of the vocal cord is best accomplished by means of suspension laryngoscopy under anesthesia induced with sodium pentothal and curare. This method affords excellent direct visualization of the vocal cords and leaves both hands free to perform the operation. This approach is largely responsible for simplifying the intralaryngeal operation so that malignant lesions may be adequately treated.

After the larynx is exposed, the tumor is again carefully examined to check on its size and extent. The vocal cord is then retracted and its under surface examined. The tumor is grasped with fixation forceps and traction is made toward the median line, thus placing the cord on medial tension while the tumor together with adequate normal appearing tissue is excised. In accomplishing this we are ever mindful of the studies of New and Fletcher,¹ who investigated the microscopic extension of vocal cord tumors from the visible edge of the growth. After excision of the growth, the base is electrocoagulated and bleeding is controlled. Hospitalization is relatively short, there is minimal reaction, and postoperative tracheotomy has never been necessary in my series of cases. Vocal rest is observed and the patient kept abed for several days.

During the healing process the defect in the anterior half of the vocal cord is gradually repaired. Occasionally, granulation tissue develops, which, when persistent, may require removal and cauterization. Because of the small size of the tumor and the consequent limited portion of the cord removed, the wound heals rapidly. In many cases cicatricial tissue replaces the lost portion of the cord in such an excellent manner that it is impossible to recognize that an operative procedure had been performed on the cord. With such satisfactory repair, one can reasonably expect a voice far superior to that obtained in the average patient subjected to the laryn-

gofissure operation. Patients who have had intralaryngeal extirpation of carcinoma of the vocal cord are kept under observation for at least five years, during which time the larynx is repeatedly examined.

Again it must be emphasized that intralaryngeal extirpation of early carcinoma of the vocal cord can be successfully accomplished only in highly selective cases. In a series of 49 cases there have been only three recurrences, or a curability rate of 93 per cent. This is the highest percentage of cures of any malignancies occurring in the larynx. These results are in no way remarkable because if the lesion is carefully selected it will be an early surface lesion, and theoretically all cancers would be curable if the diagnosis were made early and the proper treatment instituted immediately. A small lesion on the vocal cord offers an opportunity for early diagnosis, and a higher percentage of cures will be obtained when advantage is taken of this opportunity.

LARYNGOFISSURE.

If early cancer of the vocal cord is found to be too extensive for intralaryngeal extirpation and yet not sufficiently advanced for laryngectomy, consideration must be given to the operation of laryngofissure, which is an ingenious technical procedure whereby the thyroid cartilage is split externally in the median line and its interior exposed to direct vision. The indications for laryngofissure or thyrotomy are well established, although some elasticity must be permitted in interpretation of these indications because of the variations of the growth on the cord. The ideal case is an intrinsic localized lesion occupying the middle third of one vocal cord with both ends of the cord free of any growth. Posterior extension with involvement of the vocal process and fixation of the cord is a definite contraindication to such a conservative operation. Although ideal cases are seen with considerable frequency, more extensive lesions are sometimes encountered in which only by experience and judgment can the laryngologist determine whether the tumor is amenable to the laryngofissure operation. Many growths extend to but do not involve the

vocal process. Others extend to the anterior commissure and may even cross over to involve the anterior third of the opposite vocal cord. Leucoplakia involving a considerable portion of the vocal cord is being seen more frequently now than in former years. Repeated biopsies in these cases have been necessary in order to establish the presence of cancer and justify extirpation of one vocal cord. Incidentally, all patients seen by us with leucoplakia of the vocal cords have used tobacco excessively.

The technique of the laryngofissure operation is relatively simple and is usually performed under local anesthesia. An external incision is made on the median line of the neck extending from the hyoid bone to the level of the cricoid cartilage. Division of the thyrohyoid and cricothyroid membranes is necessary to facilitate exposure of the interior of the larynx. For division of the thyroid cartilage I have abandoned use of the electric saw because, regardless of the caution observed, bony necrosis occurred too frequently. I prefer the Clerf and Joseph hand saws and although more time is consumed in splitting the thyroid cartilage, no complications have developed. After the thyroid cartilage has been divided, the wings of the cartilage are spread open in order to expose the interior of the larynx to direct visualization. The vocal cords, ventricle and ventricular bands must be closely inspected and the supraglottic and subglottic regions must be examined for possible extension. Only after the growth on the vocal cord has been thoroughly studied in regard to its possible extension and depth can the operative procedure be formulated. The inner perichondrium of the involved side is dissected free and elevated from the inner surface of the thyroid cartilage well beyond the growth. The vocal cord with an adequate margin of normal appearing tissue on all sides of the malignant lesion is then excised. The bleeding areas are controlled and the entire base of the wound is electrocoagulated. The wound is closed tightly. As a rule we do not insert a tracheotomy tube unless dyspnea, secondary hemorrhage or a severe amount of emphysema develops. The safety tracheotomy through the cricothyroid membrane, as advocated

by Schall,² has much merit and should be used more frequently. An Ace bandage is applied to the neck, and the patient requested to refrain from turning the head excessively. The patient is able to leave the hospital on the sixth or seventh postoperative day, although those living out of town remain available for observation for at least two weeks. Vocal rest is prescribed for a period of time.

Complications, although uncommon, do occur and necessitate constant vigilance. When a laryngofissure is done but tracheotomy is not performed, subcutaneous emphysema of the neck, face and upper portion of the chest may appear. This may be extremely alarming but it usually subsides within a few days after attacks of coughing have been controlled. Dyspnea seldom develops unless there has been excessive trauma and extensive surgical procedures have been performed. If secondary hemorrhage occurs, the wound should be reopened to control the bleeding, either with suture or a pack and tracheotomy.

In about 35 per cent of cases of laryngofissure, granulating tissue appears at the operative site during the healing process and at times this resembles recurrences. Although the surgeon is almost certain that the growth is granulating tissue, there is always an element of uncertainty and, on the part of the patient, much apprehension. If the granulations do not disappear, they should be removed by direct laryngoscopy and examined microscopically to determine whether or not there is a recurrence. If the presence of a recurrence is established, immediate action should be taken to eradicate as completely as possible the existing malignant growth. Although surgical treatment for recurrences is not especially successful, we have had patients in whom, following the laryngofissure operation, recurrences developed which necessitated laryngectomy and these patients have survived well beyond the usual five-year period.

If the vocal cord has been removed anterior to the vocal process, regeneration of the cord can be expected with good vocal function. In some cases excellent regeneration which

compares favorably with the normal cord has occurred. If the vocal process has been partially removed, as becomes necessary at times, there occurs cicatricial fixation of the arytenoid resulting in altered vocal function. Occasional failure of the vocal cord to regenerate will leave a large empty space, which is responsible for a poor voice. In such conditions the voice can be improved considerably by resection of the thyroid alae on the affected side; this allows the soft tissue to collapse medially.

If the anterior third, or the anterior half of both cords has been removed, during healing considerable cicatrization, synechia and web formation in the anterior portion of the larynx may occur. Depending upon the extent of this process, considerable interference with breathing and speaking may result. Figi recommends the use of skin grafts in these types of operations with considerable success. The method suggested by McNaught³ of division of the synechia intralaryngeally and insertion and fixation of a properly shaped tantalum plate through a small incision made externally through the thyroid cartilage has given excellent results. This tantalum plate is allowed to remain in place for at least six weeks. These patients are again happy because they note improvement in their voices and are able to breathe adequately. It might be advantageous to consider making this a routine procedure in cases in which the anterior portion of both vocal cords must be removed and excessive synechia and cicatricial tissue might be expected. I have had little experience with removal of a wedge-shaped section of thyroid cartilage at the anterior commissure. I am appreciative of Broyles'⁴ excellent work in determining that fibres of the thyroarytenoid ligament extend into the substances of the thyroid cartilage.

The prognosis in properly selected cases for the laryngofissure operation is excellent, and if rigid adherence to the indications for ideal cases were observed, the percentage of good results probably would be much higher. Gradation of tumors is considered important and the higher the grade of

the tumor, the greater is the possibility of recurrence and metastasis. Recurrences are seen in about 15 per cent of cases, which means that 85 per cent of these patients are cured by the laryngofissure operation. The laryngologist who first examines and operates on the patient has the best chance to effect a cure. His is the task of selecting the proper operation for the particular lesion. If his choice is correct, the operation will be successful and the patient will be permanently rid of the malignant growth.

In conclusion, intrinsic cancer of the vocal cords, if seen sufficiently early, will respond successfully to either the intralaryngeal or laryngofissure operation. Both of these are considered conservative surgical procedures by which a fatal disease can be completely eradicated with approximately 93 and 85 per cent cures, respectively, and vocal function, although damaged, is still preserved.

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SYMPOSIUM: CARCINOMA OF THE LARYNX.

II — TREATMENT OF EXTENSIVE CARCINOMA OF THE LARYNX.*

HENRY B. ORTON, M.D.,
Newark, N. J.

Treatment of carcinoma of the larynx may be placed in three classifications: first, by laryngofissure; second, by total laryngectomy; and third, by some form of irradiation therapy. Dr. LeJeune has taken up the subject of carcinoma of the vocal cords. Irradiation therapy is the subject of the speaker following, and my presentation is the treatment of cancer beyond the scope of the vocal cords. In other words, the so-called extrinsic carcinoma of the larynx.

New, in his summation of the Symposium on Cancer of the Larynx before the Academy of Ophthalmology and Otolaryngology last Fall, suggested that I break down my extrinsic carcinomas of the larynx into their anatomical location. This I have done by re-examining all the specimens of cancer of the larynx that I have removed in my private practice. This paper will be the result of seeing, in private practice, 524 patients with carcinoma of the larynx, 59 of whom were inoperable at the time of their first examination. Seventy-nine refused operation, and 43 had some form of irradiation therapy, making a total of 181 cases. This leaves 344 patients who were operated upon.

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Of the 181 cases not operated, the distribution of the lesions were as follows:

Cords	57
Subglottic	12
Ventricles	7
Epiglottis	18
Epiglottis and tongue.....	16
Aryepiglottic fold	20
Arytenoid	14
Pyiform sinus and postericoid.....	37
	<hr/>
	181

It is difficult to believe, in the light of today's drive for early diagnosis, the large number of patients with true cordal cancer who refused operation. Some of these may have later seen someone else and possibly have been salvaged; of these I have no further record. I should like to add that all of these were operable at the time of my examination. The hesitancy of the patient in having the operation at the time may, no doubt, have been due to some misguided advice of friends, or doctors, in saying that if your larynx is removed you cannot talk; such is not the case, as I have repeatedly shown. Any person can talk without his larynx if he makes up his mind to learn.

Of the 43 cases that had irradiation therapy, none are alive over five years.

In the other 59 cases that were inoperable, some form of palliative treatment was carried out, such as a tracheotomy.

The treatment of extensive carcinoma of the larynx means a total laryngectomy with the removal of sufficient tissue beyond it to assure adequate cure. If the lymph nodes are palpable these are to be removed at the time of operation with the larynx, beginning at the trapezius and working mesially to the larynx, removing all lymph-bearing structure, including the sternomastoid muscle, fascia, jugular vein, fat, and the lobe of the thyroid gland on the same side.

TABLE 1.
TOTAL NUMBER OF CASES OPERATED UPON, 344.

	Oper- ated	Death Other Than Cancer Over 5 Yrs	Opera- tive Death	Recur- rence	Alive and Well Over (5) Under
Cords	132	23	2	6	69 32
Subglottic	62	4	0	17	26 15
Ventricle	38	5	1	10	16 6
Epiglottis	32	6	0	8	15 3
Epiglottis and tongue	21	8	0	7	5 1
Aryepiglottic fold.....	18	1	2	9	2 4
Arytenoid	17	4	0	1	6 6
Pyriform	24	2	1	13	4 4
	344	53	6	71	143 71

344 cases with six deaths = 1.7% OPERATIVE MORTALITY WITHIN THREE WEEKS OF OPERATION.

TABLE 2.
SHOWS THE PERCENTAGE OF FIVE-YEAR CURES ANATOMICALLY SITUATED, ALSO THE PERCENTAGE OF SUCCESSFUL CASES OPERATED UPON, MANY OF WHICH ARE NEAR THE FIVE-YEAR MARK WITH NO RECURRENCE.

	Operated	Over 5 Years	Under 5 Years Successful Cases
Cords	132	70%	98%
Subglottic	62	48%	72%
Ventricle	38	55%	71%
Epiglottis	32	65%	75%
Epiglottis and tongue.....	21	62%	66%
Aryepiglottic fold	18	16%	38%
Arytenoid	17	58%	94%
Pyriform	24	25%	41%

The larynx must be sacrificed in all of these cases, excepting possibly those cancers at the base of the tongue involving the epiglottis on the lingual side of a highly undifferentiated type, whereby suspension with diathermy as practiced by New has saved some of these cases over a five-year period.

CLASSIFICATION.

We must all realize that the site of the origin of cancer in the larynx is of the utmost importance. Anatomically it is of vast importance in deciding on the scope of the surgical treatment. It is true that only in the early stages can the true site

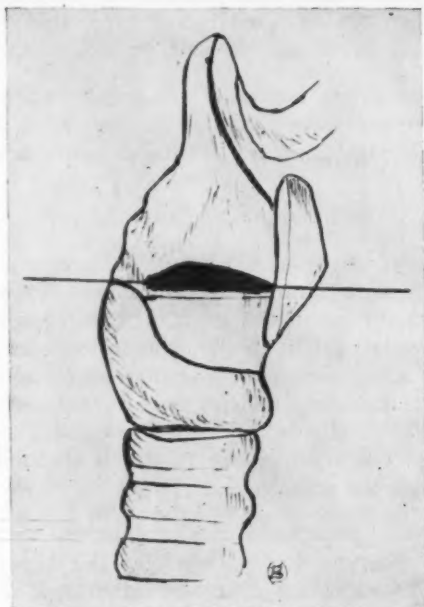


Fig. 1. Showing line drawn through ventricle; all below the line—intrinsic carcinoma of the larynx; all above the line—extrinsic carcinoma of the larynx.

of origin be definitely determined; in the more advanced cases by careful investigation into the history of the case, one may determine with a fair degree of accuracy where the original site of the cancer originated. This led to the first general classification by Krishaber, in 1879, of the intrinsic and the extrinsic group. The site of intrinsic cancer is quite definitely established. Much confusion, however, still exists as to

the extrinsic group. Much clarification I am sure would result from an anatomical classification: cancer on the epiglottis, the arytenoid, the aryepiglottic fold and the pyriform sinus, to be termed the epilaryngeal type; the postcricoid and the lateral or posterior walls of the pharynx to be termed the hypopharyngeal type. This type of classification would establish the site of origin and present the surgical problems involved. Then the so-called mixed type, the result of an intrinsic cancer becoming extrinsic, or vice versa.

Intrinsic comprises lesions of the vocal cord which when seen early are amenable to laryngofissure; while in the subglottic area, laryngectomy is the procedure of choice.

EXTRINSIC OR EPILARYNGEAL.

This group of cancer of the larynx is causing a great deal of controversy as to treatment. It is true the degree of malignancy is higher than in the intrinsic type. Insidious in its onset, it spreads rapidly to the lymphatic nodes at a very early stage. Extrinsic cancer originates around the glottic opening, or on its outer surfaces. As I have stated above, this group should be subdivided into those neoplasms arising from the epiglottis; the aryepiglottic fold; the arytenoid and the pyriform sinus, the epilaryngeal group.

Cancer of the postcricoid area, the lateral and posterior walls of the pharynx to be known as the *hypopharyngeal* group. This classification definitely establishes anatomically the site of growth.

Cancer in this region is usually of the squamous cell type, although it may be papillary or occasionally of basal cell type. Sarcoma is also found. The lymphatic nodes are invaded early and consistently; the course is fairly rapid, and unless prompt treatment is instituted, a year and one-half is the average span of life for the patient. Then, too, in these cases where the disease has extended beyond the confines of the larynx and invaded some of the adjacent structures, a more extensive operation is indicated, such as laryngopharyngectomy.

LYMPHATICS.

The submaxillary lymph nodes drain the side of the tongue along with other parts of the face; therefore, with any involvement of the posterior part of the tongue from the lingual surface of the epiglottis, the submaxillary gland with its nodes should be removed.



Fig. 2. Posterior view of pharynx showing areas in relation to extrinsic carcinoma of the larynx.

DEEP SET OF CERVICAL LYMPHATIC NODES.

A. *The infrahyoid nodes.* These lie on the thyrohyoid membrane and drain the front of the larynx. It is important to remove the pre-epiglottic space in laryngectomy.

B. *The prelaryngeal lymph nodes.* These lie on the cricothyroid membrane draining the larynx. Trotter has shown that their afferents pass through a small foramen in the middle of the cricothyroid membrane. These lymph nodes are often the first to become enlarged in cancer of the larynx. They also assist in drainage of the thyroid gland. It is well, therefore, to remove the cricoid cartilage with the larynx.

The deep cervical chain receives ultimately all the lymph from the sections above mentioned. This deep cervical chain consists of a number of large lymph nodes lying in relation to the carotid sheath. A few of these occupy an outlying position behind the pharynx. This deep chain lies along the side of the pharynx, trachea and esophagus and extends from the base of the skull to the root of the neck. These are divided into the superior and inferior by the point of bifurcation of the common carotid, or the crossing of the omohyoid muscle; both are in close relationship with the internal jugular vein, and in removing them it is necessary to strip them from the vein, or better, the jugular vein should be removed with them. Some of the lymph nodes of the inferior group project beyond the posterior border of the sternomastoid muscle into the posterior triangle of the neck. There are a few nodes of this group that lie in the groove between the trachea and esophagus; they drain the thyroid paratracheal glands. A large lymph node, situated below the angle of the jaw between the internal jugular and facial veins is known as the main lymph node of the tonsil. Another large node at the bifurcation of the carotid just below the cornua of the hyoid bone is called the main lymph node of the tongue. Finally, a large lymph node on the carotid where the anterior belly of the omohyoid muscle crosses it is known as the supraomohyoid lymph node.

The main lymph node of the tongue, in cancer of the larynx involving the base of the tongue, is the one that enlarges so rapidly postoperatively, and in many cases this lymph node may be removed and followed by irradiation.

The dissection of the neck should include the area from the angle of the jaw and tip of the mastoid downwards to below the posterior belly of the omohyoid muscle, removing the jugular vein, submaxillary gland and its nodes, fascia, the hyoid bone with the infrahyoid muscles and larynx *en masse*, with part of the thyroid gland if needed.

We must remember that the flow of lymph following a resection may have a retrograde movement, and involve

the lymph nodes in the postauricular area, posterior triangle of the neck, ending in the retropharyngeal lymph nodes.

With involvement of the base of the tongue from the lingual portion of the epiglottis, we must remember that the cancer cells in the tongue may pass readily from one side to the



Fig. 3. Showing areas involved in extensive carcinoma of the larynx.

other. From this it becomes necessary to deal with both sides of the neck. When we have a patient who has the entire length of the deep cervical chain of lymphatic nodes involved in a fixed hard, firm mass, extending to a point below the infraomohyoid muscle, it is needless to say that we cannot

expect to cure the cancer. By that time the cells have already entered the thoracic duct into the general blood stream.

Complete destruction of all cancer cells is at present the only known method of effecting a permanent cure, whether this be by surgery, irradiation or by some biological change in our makeup.

With this in mind, the surgeon when operating should be careful about disturbing the growth at the time of operation so as not to cause metastasis by inoculation. The operation should be sufficiently radical to get well beyond the growth, keeping in mind that New's observation on the microscopic extension of the growth taken at 5, 10 and 15 mm. from the apparent margin of the growth found the maximal extension of highly malignant tumors was 15 mm. This has been confirmed by Broyles and Snitsman, who have shown that the cancer cells have extended beyond the apparent growth histologically, in the anterior commisural growths of the cords, another reason why the pre-epiglottic space is invaded early and should be removed with the larynx. I have also demonstrated this at the time of operation in epiglottic cancer below the hyoepiglottic ligament.

PRE-EPIGLOTTIC SPACE.

Jean Leroux Robert published a paper, *Les Epitheliomes Endolarynges*, in 1936, in which he demonstrated the invasion of the pre-epiglottic space, and Tambien demonstrated histologically that cancer of the vestibule and ventricle of Morgagni invaded the pre-epiglottic space and stated that the classical laryngectomy is insufficient for the complete eradication of cancer in these cases.

It is true that for years I had been removing the hyoid bone in complete laryngectomy, but it was not until early in 1939 when I received from Dr. Ricardo H. Bisi, of Buenos Aires, his book on *Cancer of the Larynx*, published in 1938, that I realized that the hyoid bone should be removed *en masse* and not separately. I was shaving the base of this pre-epiglottic

space instead of going completely around it. Since then I have recognized its value and have been following his procedure in all my laryngectomies and have not regretted it, as the results have been very satisfactory and gratifying.



Fig. 4. Showing the relationship of base of tongue with epiglottis.

I feel that it is a most important step in the treatment of cancer of the larynx.

A true intrinsic cordal cancer limited to the midthird of one cord is ideal for laryngofissure, but with a growth at the anterior commissure you must go through the pre-epiglottic space, a very potential danger area for recurrence. We cannot be conservative when dealing with cancer. I agree with Clerf and thank him for bringing the subject up again in his paper, Pre-Epiglottic Space, in its relation to cancer of the epiglottis. His keynote was "that we should get away from conservative treatment of cancer of the larynx, we gain nothing by appeasing cancer by subperichondrial resection, narrow fields, etc."

This space is described by Robert as follows, "This space is triangular or funnel-shaped, in the sagittal section it is triangular with its base upwards and the vertex point downwards. It is an actual space filled with cellular and adipose

tissue. It contains no lymph nodes. The anterior and lateral walls are composed above by the thyrohyoid membrane, and below by the anterior superior angle of the thyroid alae. The posterior wall is formed by the epiglottis from its middle to lower extremity, which is situated immediately above the



Fig. 5. Drawing showing the pre-epiglottic space.

anterior commissure of the vocal cord. It is closed above by an aponeurosis which forms the roof, and extends from the posterior surface of the hyoid bone and inner border of the cornua to the middle of the anterior surface of the epiglottis; the hyoepiglottic ligament. This space is often invaded by cancer which attacks the lower portion of the epiglottis, vestibule of the larynx and the false cord. In order to completely encircle these growths the entire larynx, pre-epiglottic space and the hyoid bone should be removed *en masse*."



Fig. 6. Showing the lymphatic drainage in the neck.

It is common to find cancer cells microscopically in the pre-epiglottic space well beyond the apparent anatomical margins of the growth. This invasion cannot be determined beforehand, either by direct or indirect examination of the larynx. The pre-epiglottolaryngectomy as designed by Bisi should be practiced in all cases.

LARYNGECTOMY.

The indications for laryngectomy are as follows:

1. When the growth has extended to the anterior commissure or has extended backwards to the arytenoid.

2. When the epiglottis is involved below the level of the hypoglottic ligament.
3. When the growth has crossed to the opposite side, and there is subglottic extension.
4. The growth springing from the ventricle or ventricular fold.

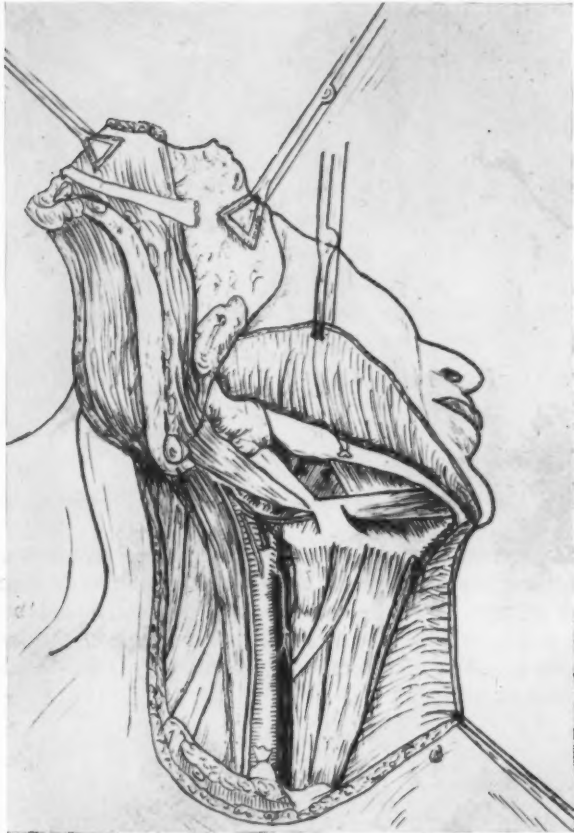


Fig. 7. Showing extent of complete block dissection of the neck.

5. The growth has invaded the thyroid cartilage or cricothyroid membrane.
6. In extrinsic carcinoma of the larynx.
7. Definite fixation of one or both vocal cords.
8. The growth is subglottic in origin.
9. In a recurrence following a laryngofissure operation.
10. Where the larynx has been subjected to unsuccessful irradiation in selected cases.

Also to be considered in these cases is the extent of the growth and its location. With a growth situated as above stated, a laryngectomy is the procedure of choice. These indications should be well understood; however, it is surprising that now and then we find a patient in whom conservative surgery has been used to the detriment of a lasting cure.

TREATMENT.

Complete removal of the primary growth is the utmost consideration in any operative procedure. The general physical condition of the patient must be such that he is a reasonably good operative risk.

The antibiotics unquestionably have been a great factor in postoperative results by keeping down infection.

The incision used is one best suited to the surgeon, providing it gives him adequate exposure, so as not to unnecessarily traumatize tissue. As I have already stated, the procedure must insure complete eradication of all diseased tissue, ranging from simple laryngectomy to complete laryngopharyngectomy; and if at all possible in the latter, to try to leave some normal pharyngeal mucosa for closure, instead of a large pharyngostome to be closed later by plastic.

PROGNOSIS.

The prognosis as to possible cures of these extensive lesions are in the following order: 1. Cords; 2. Epiglottis; 3. Epiglottis and Tongue; 4. Arytenoid; 5. Ventricle; 6. Subglottic; 7. Pyriform Sinus; 8. Aryepiglottic Fold.

SUMMARY.

1. The extrinsic carcinomas of the larynx have been broken down and placed in their anatomical sites.

2. The operative procedure for these extensive lesions must be laryngectomy, and at the time of operation sufficient contiguous tissue surrounding the carcinoma must also be removed to assure complete eradication of the disease.

3. If the lymph nodes are involved, they should be removed at the time of the original operation on the larynx.

4. In some cases it may be necessary to do a very extensive gland resection plus the larynx and enough of the pharyngeal tissue to insure adequate removal, which may result into a laryngopharyngectomy.

5. Results of these procedures are shown.

224 Delavan Avenue.

SYMPOSIUM: CARCINOMA OF THE LARYNX.

III — ROENTGEN THERAPY OF CARCINOMA OF THE ENDOLARYNX.*

J. A. DEL REGATO, M.D. (by invitation),
Colorado Springs, Colo.

In the past 30 years a slow but steady progress has taken place in radiotherapy of cancer. This progress has been due primarily to the development of rational techniques of treatment based on better knowledge of physics and radiobiology, to better dosimetry, to the technical perfection of equipment and to the advent of supervoltage Roentgen therapy. The progressive improvement of results in the treatment of carcinoma of the cervix and carcinoma of the lower lip, among others, have clearly shown this undeniable progress.

In these three decades there has been also remarkable improvement in the results of surgery of cancer. Surgical progress has been mostly due to better knowledge of anesthesia, to better pre- and postoperative care and to the advent of antibiotics, all of which have resulted in diminished operative mortality and enlargement of operability to include advanced lesions and aged patients (*e.g.*, cancer of the large bowel); and progress has been made also in the designing of new interventions (*e.g.*, pneumonectomy, esophagectomy), to be applied to previously inoperable tumors.

Progress in surgery as well as in radiotherapy of cancer has been in part due to wider understanding of the pathology of tumors, of their varied characters and life expectancy, of their invading and metastasizing habits; in other words, of their natural history. This common ground has brought about

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greater understanding of the possibilities and of the relative merits of both forms of treatment, resulting in considerable agreement among those interested in the nature of the disease first, and concerned secondarily with the character of their special skill; but, whereas the improvements in surgery have found immediate, enthusiastic, capable and vast application and consequent appreciation, the improvements in radiotherapy of cancer have not been rapidly assimilated or even recognized everywhere. The result has been a state of uncertainty and consequent overenthusiastic surgical excesses, advocated by the honestly uninformed or the youthfully inexperienced.

One could easily save several times more lives by the simple expedient of introducing skilled radiotherapy to certain institutions than by the combined application of all other, considerably more expensive, available measures of detection and early diagnosis of cancer. In radiotherapy, as in any other medical specialty, a thorough adequate training is the shortest way to better performance; yet, most institutions in need of a therapeutic radiologist are obliged to choose a self-initiate for lack of sufficient numbers of well trained radiotherapists. As a result of a shortage of capable advocates, the responsibility for therapeutic radiology is disseminated in the departments of physics, dermatology, gynecology, hematology and even of plastic surgery, instead of being properly centralized under competent scientific control in the hands of those who understand the common principles of its varied application and its hazards; but, while all efforts are justifiably put to play in the endeavor to increase the results of surgery of cancer, departments of radiology are expected to carry on their duties without right to hospitalization of patients.

In otorhinolaryngology the rôle of radiotherapy has been definitely established in these three decades as the undisputed choice in the treatment of nasopharyngeal and tonsillar tumors, as well as of primary lymphosarcomas and undifferentiated carcinomas in any location. If the results of radiotherapy of these forms of cancer and of these regions have not always been remarkable, they are the only results obtainable and they require, at that, more than amateurish endeavor.

ors and skill; however, the treatment of cancer of the larynx has been the subject of uninterrupted honest disagreement for a long time. There is here also an area of possible agreement, but it is clouded by the inequality in experience with both forms of treatment, by the inequality in size and inequality of material available to different workers, by the inequality of segregation of patients by different authors and unequal use of certain words (*e.g.*, intrinsic) and by unequal reporting of results. In the presence of some of its most brilliant protagonists and advocates, I would not presume to analyze here the merits of surgery of cancer of the larynx. Allow me, therefore, to present only our views in respect to what we believe are its proper indications.

First, we should analyze the group of carcinomas of the *hypopharynx*. These tumors arise mostly in the pyriform sinus and may, though not always, invade the larynx secondarily; they are usually thrown in the large duffel bag of so-called "extrinsic" carcinomas of the larynx, yet they do not deserve to be called carcinoma of the larynx any more than a carcinoma of the stomach which directly invades the liver deserves to be called a hepatoma. We prefer to include also in this group the few borderline lesions which could be called laryngopharyngeal carcinomas, such as those arising in the free border of the epiglottis or arytenoepiglottic fold, which may extend both inside and outside the larynx. In this entire group of hypopharyngeal and pharyngolaryngeal tumors the accomplishments of radiotherapy have been rather poor. This has been partly at least due to the usual extensive development, frequent cartilage destruction and almost constant voluminous metastases which accompany these tumors. Any effort dedicated to improve these results either by means of radical interventions or any other means should be naturally welcomed.

Then we have the carcinomas arising within the limits of the larynx proper, or carcinomas of the *endolarynx*; these tumors are diagnosed relatively earlier, their extension is more limited and they metastasize less frequently than those

arising outside the larynx. Both total laryngectomy and Roentgen therapy have been capable of curing a certain proportion of these tumors (see Table 1); but the results by either method have never been sufficiently satisfactory to justify its exclusive use. Radiotherapy has the advantage of being conservative, and when properly used it does not interfere nor handicap the possibilities of subsequent radical

TABLE 1.
RESULTS OF ROENTGEN THERAPY OF CARCINOMA
OF THE ENDOLARYNX.

Author	Year	Cases	Lost to View or Dead of Intercurrent Diseases*	Well 5 Years or More	Absolute 5-Year Survival
Baclesse	1919				
	1940	215	7	48	—
Lenz	1931				
	1941	128†	15	23	—
Harris	1931				
	1942	80†	13	37	—
Cutler	1938				
	1942	107	7	37	—
Low-Beer	1936				
	1945	63	11	26	—
Total	1919				
	1945	593	46*	171	29%

*All these were considered as failures.

†Including some hypopharyngeal and laryngopharyngeal lesions.

surgery. Total laryngectomy, while not offering much better results, condemns the patient to either artificial larynx or esophageal speech; this handicap is variously accepted or compensated by the patients and may be indeed a more serious mutilation than the loss of a limb, or of a lung. Without overplaying the drama of a mutilation produced by a curative surgical procedure, one must hesitate to impose it upon a patient when conservative procedures could be carried out successfully; lack of available radiotherapeutic skill has often given the necessary excuse.

A subdivision of carcinomas of the endolarynx into supraglottic, glottic and subglottic lesions may lead us to a fruitful understanding of choice indications of treatment. The *supraglottic* carcinomas, that is, those arising from the laryngeal wall of the epiglottis, the false cord and the laryngeal ventricle, are often relatively less differentiated tumors, they spread through the soft tissues anteriorly and laterally and frequently recur following surgical removal of the larynx and inadvertent incision through tumor. This group of tumors, in spite of their extension and cartilage destruction, may be successfully treated by means of radiations in a good number of instances, and for these reasons we feel that Roentgen therapy is their treatment of choice. Carcinomas of the *subglottic* region of the larynx are often differentiated lesions which rapidly occlude the air passage, necessitate a tracheotomy and often infiltrate the anterior wall of the esophagus. Roentgen therapy has been successful in the treatment of these subglottic lesions (Baclesse); but in general a laryngoesophagectomy offers greater chances of control, so that we feel that radical surgical removal is the treatment of choice of these carcinomas. Finally, we have the *glottic* lesions, or carcinomas of the vocal cord proper, which include the so-called "intrinsic" carcinomas of the larynx. Carcinomas of the vocal cord that are accompanied by edema or fixation of the larynx are infrequently controlled by Roentgen therapy, and we feel that they are best treated by total laryngectomy; on the contrary, small or exophytic lesions of the cords can be controlled with relative ease by Roentgen therapy (see Table 2), and in such cases we prefer this form of treatment in preference to total or partial surgical procedures. Lastly, we wish to re-emphasize that when radiotherapy has been carried out adequately, recurrences may receive the additional full benefit of a total laryngectomy without hindrance.

We have said nothing of the technique of Roentgen therapy and unquestionably this is of paramount importance. We favor a protracted treatment spread over at least 10 weeks; treatments must be carried out under constant clinical control; fields should be adequate, square or round, but as small

TABLE 2.
ROENTGEN THERAPY OF EARLY CARCINOMA
OF THE VOCAL CORDS.

Author	Year	Cases	Well 5 Years or More	Absolute 5-Year Survival
Baclesse	1919			
	1940	14*	10	—
Lenz	1931			
	1941	10†	8	—
Harris	1931			
	1942	8‡	5	—
Cutler	1938			
	1942	15†	10	—
Low-Beer	1941			
	1945	19†	15‡	—
Total	1919	66	48	73%
	1945			

*Limited to one cord.

†Suitable for "laryngofissure."

‡Four years' minimum control.

as possible; two lateral fields are preferable; well filtered radiations assure a more homogeneous irradiation; dosage will vary according to protraction, size of fields, etc., but usually several thousand Roentgens must be delivered to the tumor area; the dose administered is not an amount known to be the necessary one to destroy the tumor, but rather the maximum permissible dosage with safety to normal structures, under the circumstances of the treatment.

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SYMPOSIUM: CARCINOMA OF THE LARYNX.

IV — CANCER OF THE LARYNX. FIVE-YEAR RESULTS.*

LEROY A. SCHALL, M.D.,
Boston, Mass.

In 1947, we rendered a report¹ on a statistical study of patients with cancer of the larynx seen at the Massachusetts Eye and Ear Infirmary between the years of 1930 and 1945, inclusive. Although the group of patients seen between 1930 and 1940 had been followed five years and longer, we acknowledged that all of the group seen between 1941 and 1945, inclusive, had not, in 1947, been followed five years, and an evaluation of their treatment, therefore, was inconclusive.

This report will complete the study of the group of patients seen from 1941 to 1945, inclusive, and followed five years or longer.

The number of patients with cancer of the larynx seen during this period and followed with accurate records was 228. In this series, the records show the type of treatment selected to have been:

External irradiation	132 cases
Laryngofissure	23 cases
Laryngectomy	60 cases
Cordal lesions—external irradiation.....	13 cases
<hr/>	
Total	228 cases

*Read as part of a Symposium at the Fifty-fifth Annual Meeting of the American Laryngological, Rhinological and Otological Society, Inc., Atlantic City, N. J., May 7, 1951.

†From the Department of Otolaryngology of the Massachusetts Eye and Ear Infirmary, Boston, Mass.

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The radiologic treatment of these patients with laryngeal cancer was carried out by the Department of Radiology of the Massachusetts General Hospital. Most of the patients received supervoltage irradiation to skin tolerance, receiving at least 6,000 r. or more tumor dosage.

In 1947, our results from external irradiation of laryngeal cancer as reported in our earlier communication were:

CANCER TREATED WITH EXTERNAL IRRADIATION.

Years	Cases	Dead	Five-Year Cure
1930-1935	24	18-75%	6-25%
1935-1940	75	53-77%	17-22.6%

The study of patients seen during 1941 through 1945 with an accurate follow-up on all cases treated by external irradiation reveals:

CANCER TREATED WITH EXTERNAL IRRADIATION

Years	Cases	Dead	Five-Year Cure
1941-1945	132	114-86%	18-14%

In addition to these cases of laryngeal cancer treated in our clinic, I have seen, in consultation, at least 10 patients treated at other clinics who had received from 10,000 to 12,000 r. of irradiation without control of the disease.

Laryngeal Cancer Treated by Laryngofissure:

In 1947, our results of laryngeal cancer treated by laryngofissure during the years 1930 to 1940 was only 58 per cent five-year cures in 31 cases. From an analysis of the records we came to the conclusion that in our clinic too many surgeons with but little cancer interest were not only selecting the patients for operation but were also doing the surgery. Since 1940, the cancer problem has been my responsibility. Although I have selected the patients and have either done or supervised the surgery, our five-year results have not improved.

CANCER OF THE LARYNX TREATED BY LARYNGOFISSURE.

1941-1945.

Five years or longer (no recurrence).....	11
Dead from local recurrence	4
Dead from other causes—less than five years.....	2
Dead—distant metastasis—no local recurrence.....	2
Laryngectomy after laryngofissure—dead.....	2
Laryngectomy after laryngofissure—five-year cure	2
Total	23

Laryngeal Cancer Treated by Laryngectomy:

In the 1947 report, our results of total laryngectomy were:

LARYNGECTOMY.

Years	Cases	Dead	Five-Year Cure
1930-1940	44	16-36%	28-64%

For the group of patients so treated between 1941 and 1945, inclusive, the results were:

Years	Cases	Dead	Five-Year Cure
1941-1945	60	27-45%	33-55%

Included in this series of laryngectomized patients there are nine cases in which irradiation failed to control the disease. These are not included in the table on the results of external irradiation.

LARYNGECTOMY AFTER X-RAY FAILURE.

Years	Cases	Dead	Five-Year Cure
1941-1945	9	9-44%	5-56%

Our results from laryngectomy in the 1941 through 1945 series are not so good as in the 1930 through 1940 series.

Perhaps this may be due to the fact that we have become increasingly bold in our surgical risks and are accepting cases that would have been considered inoperable in our earlier experience. Perhaps some of these cases would fall into a group that might be labeled "Salvage Surgery."

In the operation of total laryngectomy we have never performed the so-called narrow field of surgery. It has been our practice to do, what we like to call, a block removal of the larynx with its musculature. The prophylactic neck dissection as originally described by Sylvestre,⁴ deserves serious consideration. We would like to restate our position concerning total laryngectomy from our 1947 report:

"The psychology of a surgeon dealing with cancer should be radical. The problem is how much can be removed and not how little. When a patient is faced with the loss of his larynx, he is not interested any longer in conservative surgery. The routes of extension of cancer of the larynx have been well demonstrated by Taylor and Nathanson,² and the importance of removing the pre-epiglottic space has been emphasized by Bisi.³

"In total laryngectomies, we have always used the "T" incision or the "U" incision of Gluck-Soerensen. The sternohyoid muscles and anterior belly of the omohyoids are removed with the hyoid bone or the body of the hyoid bone.

The pretracheal gland on the cricothyroid membrane is always examined microscopically for cancer. The pretracheal muscles are removed since they are rich in lymphatics and are in close relation to the pretracheal gland. We have found metastatic cancer in the sternohyoid muscle when, on gross inspection, it could not be detected. The thyrohyoid muscle is removed with the larynx.

"The carotid sheaths are always exposed and examined for involved glands and, should they be found, a radical neck dissection is done along with the laryngectomy.

"In cases of laryngeal cancer with unilateral cervical metastasis, Sylvestre⁴ and Brunschwig⁵ have demonstrated not

only their operability but also an encouraging curability by radical neck dissection and laryngectomy."

In 1947, we reported on a small group of cases with cordal cancer which were ideal for laryngofissure but which were treated by external irradiation. We now have the five-year results of this group of cases:

CORDAL CANCER—IDEAL FOR SURGERY—
TREATED BY IRRADIATION.

Years	Cases	Dead	Five-Year Cure
1941-1945	13	1	12-92%

To complete and summarize our results in the treatment of cancer of the larynx for all patients seen between 1930 and 1945, on whom we have accurate follow-up and, therefore, followed for five years and longer, we report our results to be:

CANCER OF THE LARYNX.

Treatment	1930-1945.		Five-Year Cure
	Cases	Dead	
Irradiation	231	190	41-17.7%
Laryngofissure	54	22	32-59%
Laryngectomy	104	43	61-58%
Cord cancer—X-ray.....	13	1	12-92%
Total	402	256	146-30.7%

CONCLUSIONS.

1. Carcinoma of the larynx is still a serious disease and five-year results still depend upon early diagnosis and prompt treatment.
2. Statistics such as these serve only to record our personal experience.

3. Cancer is still unpredictable and cancer of the larynx still calls for a careful evaluation and individual consideration of each case. The type of treatment selected must be based on the pathology of the lesion, on the extent of the disease, on its duration and on the condition of the patient.

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SYMPOSIUM: CARCINOMA OF THE LARYNX.

V — SUMMARY OF CANCER OF THE LARYNX SYMPOSIUM.*

GORDON B. NEW, M.D.,
Rochester, Minn.

Dr. LeJeune has presented the treatment of early cancer of the larynx in a very thorough, concise manner, indicating the growths to be removed under suspension laryngoscopy and those requiring thyrotomy. I agree entirely with his indications and treatment. The results of the removal of these early selected cases by surgical diathermy using suspension laryngoscopy are excellent. There is good function without the dryness of the mucous membrane that I have seen at times following irradiation. These cases must be carefully selected by a laryngologist with a broad knowledge of laryngeal pathology and aided by an examination of fresh frozen sections of the tissue at the time of operation. Dr. LeJeune says that 6 to 7 per cent of his cases of cancer of the larynx are removed in this manner. From his description of the size of the lesions he has treated, I believe that even larger well localized growths can be safely removed in the same way. In a recent study 11 per cent of our cases were treated in this manner.

In mentioning some points in the technique of thyrotomy, he says that he has given up the use of the electric saw for dividing the thyroid cartilage in doing a thyrotomy as it at times produces a necrosis. This can be eliminated by having the first assistant direct a stream of cold water from a syringe

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over the cartilage during the process of dividing it. I prefer an electric saw to a hand saw, but use a cord-driven dental engine that works very satisfactorily.

The question as to making a tracheotomy, after the removal of a growth by means of thyrotomy, depends entirely upon just how much tissue is removed and the chance of a secondary edema developing with obstruction. Personally, I would rather make a few extra tracheotomies at the time of the operation than to have to do a secondary one after the patient is partially obstructed from edema. Postoperative emphysema of the neck, face and chest may be avoided by insertion of a split rubber drainage tube into the lower extremity of the wound down to the cartilage and leaving it for from 24 to 48 hours. All thyrotomy patients, as Dr. LeJeune has brought out, should be examined two months after operation for the removal of a possible granuloma that may be present, interfering with the perfect approximation of the vocal cords. In cases where both sides of the larynx have to be electrocoagulated at the time of the thyrotomy, one side may be malignant, and the opposite cord a thickened leucoplakia. Raw surfaces are produced on both vocal cords anteriorly that may cause an adhesion. This can usually be prevented by the insertion, at the time of the operation, of a soft rubber prosthesis covered by a finger cot, the same type as used in skin grafting the larynx, and suturing it in place through the skin with heavy sutures. This should be left in place two or three weeks and then removed from above. Holding the raw surfaces apart allows them to heal laterally. I know Dr. LeJeune will agree with me that in some cases an exploratory thyrotomy is indicated to determine whether the growth can be removed in a conservative way or whether a laryngectomy should be done.

I wonder whether Dr. LeJeune would tell us how he feels about the use of irradiation for epithelioma of the vocal cords.

Dr. Orton as usual has presented a very complete report on the indications for laryngectomy for extensive carcinoma of the larynx with his reasons for recommending that the pre-

laryngeal area, the hyoid bone and the pre-epiglottic space be removed *en masse* along with the larynx. He does a complete block dissection of the cervical glands if one is palpable.

To begin with, he accepts for surgical treatment 65 per cent of the cancer of the larynx patients he has seen, not including 76 patients who would not be operated upon. In my opinion this 70 to 75 per cent is about the right percentage of cancer of the larynx cases that can be benefited by surgical treatment.

He has divided the growths into eight locations as to the primary lesions, and his excellent results speak for themselves, showing what can be accomplished by untiring work of one interested in this field. He advises a cervical gland dissection when there is a palpable gland. Metastatic glandular involvement in carcinoma of the tongue usually involves the deep midcervical jugular gland, as in carcinoma of the larynx. The growth is usually more active. A group of cases in which a clinical diagnosis was made as to lymph node involvement in carcinoma of the tongue was recently reviewed. When there were no palpable nodes clinically, there were 22 per cent in which the microscopic examination showed involvement by malignancy at the time of operation. In those in which there were indeterminate nodes present, that is, where there was a question clinically as to whether or not they were malignant, 67.5 per cent were positive microscopically at the time of operation; so that we must assume that there is considerably more glandular involvement in these cases than is evident clinically.

I would think that Dr. Orton's end-result tables would be still more valuable if the cases in which cervical gland dissections were done were grouped together. These might be divided into two groups, those with and those without proven microscopic gland involvement. This would aid in showing what is accomplished by a prophylactic gland dissection in addition to the laryngectomy and also what end-result can be expected from a block dissection when a mid, deep cervical gland is involved. I would like to ask him if he has done gland dissections when there are *no* glands palpable; and whether there

are any proven microscopically involved glands in those cases. Should all extensive cancer of the larynx have gland dissection regardless of whether any glands are found clinically? I would like to ask Dr. Orton if he uses radon seeds or irradiation in addition to surgery.

I did not receive Dr. del Regato's paper, but he wrote me a letter describing the indications for treatment of cancer of the larynx with irradiation; however, no mention was made of the end-results. Depending upon the location of the lesion, he divides the cases into four groups, which determines the method of treatment, but he does not mention any other factors such as the activity of the growths.

First, the small lesions of the vocal cords he prefers to treat with X-ray; "when they recur, a total laryngectomy is always possible without lessened chance of success." I am afraid I cannot agree with this statement. The secondary edema that occurs at times following irradiation makes it difficult to tell whether there is a recurrence present or whether the edema is the result of irradiation. At times an exploratory thyrotomy is the only way that one can be sure that there is a growth present and then it is found to be quite extensive. If a laryngectomy is necessary, the patient has lost the chance of a cure from a conservative operation which he would have had originally.

The second group of cases are "those of the glottis that have already fixed the larynx and which are accompanied with edema." He prefers to treat them by laryngectomy.

The third group of cases are "the supraglottic tumors which are less successfully treated by laryngectomy than by irradiation, so that the latter is the treatment of choice." I feel that the supraglottic carcinoma should be treated by teamwork of the laryngologist and the radiologist in order to give the patient the best chance to get well. These growths, of course, do not all require laryngectomies as he suggests. The growths of the epiglottis that are movable are best treated either by transhyoid pharyngotomy or, after a preliminary tracheotomy, by removal of the epiglottis with surgical dia-

thermy under suspension laryngoscopy. Radon seeds are usually inserted at the time into the base and into the pre-epiglottic space and base of the tongue. A gland dissection is frequently done if the extent and type of the primary lesion warrants it. Fractional X-ray should follow this treatment so that everything possible is done. The patient has to wear a Rehfuß feeding tube and a tracheotomy tube for at least two months due to the reaction, but if the growth is all supra-glottic and movable, the vocal cords are not injured so that a good voice results.

The fourth group, the subglottic growths, Dr. del Regato states should be treated by laryngectomy. In the letter no mention is made of end-results or length of time he has followed this particular method of selecting cases for treatment. Grading of cancers apparently is not taken into consideration. Would Dr. del Regato please comment on this?

I wish I could correctly evaluate Dr. Schall's results, either from the surgical or irradiation treatment of cancer of the larynx. In the text that I received, the indications for the selection of treatments were not given. In his conclusions, he states that cancer of the larynx is a serious disease and five-year results still depend upon early diagnosis and prompt treatment. I feel, and I am sure he does too, that the selection of the *type* of treatment for the individual case is very important factor in the end-results. In the 228 patients that he treated between 1941 and 1945, 145, or 63 per cent, were treated by irradiation. This includes 13 patients with tumors of the vocal cords. Only 83 patients, or 37 per cent, were treated surgically by laryngectomy or thyrotomy. This small percentage of cases selected for surgery should produce a higher than usual five-year cure, but it apparently has not. The 132 patients treated with external irradiation produced 14 per cent of five-year cures. This does not include the 13 patients with lesions of the cords who gave a 92 per cent five-year cure. The extent or activity of these growths is not stated. I am wondering if these 13 lesions on the vocal cords that were treated by irradiation and resulted in a 92 per cent

cure might not be comparable to those early growths that we would treat under suspension laryngoscopy and surgical diathermy, or were they larger growths? I would like to ask Dr. Schall if he has changed his ideas as to the selection of treatment from the results that he has presented. Does he still feel that only a little over a third of the patients with cancer of the larynx should be treated surgically?

There is no one form of treatment that is superior to all others in all cases of cancer of the larynx, as has been brought out by these excellent presentations. On the contrary, the type of growth in question, its activity, extent, location and general condition of the patient should determine what type of treatment should be instituted. In general the low grade carcinoma should be treated surgically, and the extensive high grade growth treated by surgery and irradiation or irradiation alone. In general about 70 to 75 per cent of cancer of the larynx may, for the patients' best interests, be treated surgically. Irradiation has a very definite place as a therapeutic measure in the treatment of cancer of the larynx. I have seen patients with very active cancers, even with cervical metastasis, that could not be benefited by any type of surgery, who have remained well many years following irradiation. The cases selected for X-ray or radium should be just as carefully reviewed as those for surgery. Growths that recur after irradiation are very serious problems, as they are much more difficult to control and are much more extensive than is apparent. Prophylactic gland dissections have not been done on our patients, but block sections are done when a cervical gland is involved, and the primary lesion is surgical. Nineteen per cent of five-year cures have been obtained in patients with carcinoma of the larynx with cervical glands involved, proven microscopically.

Patients with carcinoma of the larynx usually have but one good chance to get well, so the laryngologist who determines the treatment must assume a serious responsibility. To tell a patient that conservative treatment may be tried and if this fails he still can have a radical operation usually does not

result in the best interests of the patient. When the growth recurs, it is too late for any type of conservative operation that will leave the patient with a good voice, and the end-result of radical surgery is frequently not good. I am not referring to post-laryngectomy pharyngeal speech, which is an excellent substitute. In making the selection for the best treatment for the individual patient, we should all bear in mind the end-results that have been accomplished by the use of well established surgical methods with certain additions and modifications such as have been reported today. As I have stated before, irradiation has a very definite place in the treatment of cancer of the larynx. Further attempts to improve the surgical results are being made, such as prophylactic bilateral cervical gland dissection. Whether this will improve the five-year end-results, time will tell.

EXPERIENCES WITH PARENTERAL VITAMIN A THERAPY IN DEAFNESS AND TINNITUS.*†

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The anxiety of every otologist to find means to improve the hearing of his deafened patients makes him especially receptive to any new form of therapy that is alleged to be helpful. This anxiety, however, has usually been tempered with caution in view of past experiences with many forms of therapy that have been presented as successful, only to prove disappointing as time passed by.

Recently, favorable results have been reported in both deafness and tinnitus with the use of parenteral vitamin A. I am sure that many of you have wondered how substantial is this improvement and for how long it has or will last.

Lobel,¹ in May, 1949, presented a new injectable vitamin A preparation‡ which produced improvement in hearing and tinnitus in a considerable number of the approximately 300 patients on whom it was tried.

Subsequently, Anderson, Zoller and Alexander,² and Bau and Savitt,³ using the treatment as outlined by Lobel, also reported high percentages of favorable results in patients with deafness and tinnitus.

This vitamin A preparation was made available to me§ in June, 1948, at which time I began my own studies. In reviewing my results and comparing them with those of the writers just mentioned, I am reminded of an incident that occurred a

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‡Anatola (Lobel), Parke, Davis & Co.

§Provided through courtesy of the manufacturer, Parke, Davis & Co.

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short while ago: a recent report on the results of X-ray therapy to the nasopharynx for epidermoid carcinoma revealed a higher cure rate than that of our own. A little perturbed, I asked our own X-ray therapist, Dr. Robert R. Newell, an outstanding man in the field, if a review of our own cases with the therapy given might not be indicated. He replied, "No, it's just the same old story—everybody can cure cancer but me." I feel, in this comparison, as did this distinguished gentleman—"everybody can cure deafness but me."

Lobel's studies were prompted by his belief in the relationship between hearing loss and nutrition, especially the vitamin A factor. He stated, "Mellanby⁴ has shown that animals placed on an A-free diet develop degenerative changes in the auditory capsule, in Scarpa's and the spiral ganglion. Wolbach and Howe⁵ observed that vitamin A deficiencies resulted in a metaplasia of the ectodermal leaf and a substitution of keratinized epithelium for stratified epithelium in the respiratory tract, ocular tract, paraocular glands, alimentary and genitourinary tracts. Failure in the reversal of these degenerative processes may be due to the inability of the body to utilize the vitamin A because of hepatic or various glandular dysfunctions, or the therapeutic time interval in different persons."

Lobel developed an injectable vitamin A preparation consisting of olive oil, terpins, and the "A" factor of a concentration of 50,000 units per cubic centimeter. He thought that the injectable preparation facilitated the absorption of vitamin A by the tissue in contradistinction to the uncertain absorption when vitamin A is administered in an oily vehicle only.

Lobel further stated: "Pharmacologically the terpins act as antispasmodics and analgesics and in this manner serve to initiate a large part of the amelioration of the ensuing tinnitus. The combination of the terpins, olive oil and 'A' factor is taken up by the blood stream. The vitamin A is absorbed and stored and the terpins are excreted in part by the upper respiratory tract and its adnexa. It appears, therefore, that by the manner of administration described, the reaction in

Scarpa's and the spiral ganglion, as observed by Mellanby, is *reversible** — the drug is made available to the middle and inner ear."

This statement, that the reaction in Scarpa's and the spiral ganglion is reversible by the administration of vitamin A, is *contradicted* by the experiments of Perlman.⁶ Perlman, working on rabbits, confirmed Mellanby's experiments on young dogs fed on vitamin A deficient diets. Mellanby's dogs showed: *a.* nerve degeneration, more especially of the cochlear neurons; *b.* new bony growth in the modiolus; *c.* overgrowth of the internal periosteal layer of the capsule, that is, the bone in proximity to the brain; *d.* degenerative changes in the organ of Corti and sensory epithelium of the semicircular canals; *e.* occasionally a small amount of bony overgrowth was seen in the basal whorl of the scala tympani. Serous labyrinthitis as reported by Mellanby was not confirmed by Perlman.

After the animals in Perlman's experiments were depleted of vitamin A (see Fig. 1) they were fed with a vitamin A rich diet. This feeding, after depletion, did not restore the labyrinthine capsule to a normal state (see Fig. 2). Excess of periosteal bone on the internal surface remained but became more compact, and the large islands of vascular connective tissue were replaced by compact bone (see Fig. 3). The degenerative changes in the nerve fibres and ganglion cells were also not reversed. Secondary changes in the neural elements of the VIIIth nerve also showed no signs of reversal. Changes within the labyrinth appeared to be secondary to compression of the structures in the internal meatus by the new bone formation (see Fig. 4). Considerable compression of the cochlear nerve was found compatible with good auditory function as tested by the acoustic middle ear muscle reflex.

Much has been written concerning the possible relationship between vitamin deficiencies and deafness in humans, but unequivocal, convincing evidence is still wanting. The low incidence of acquired deafness in our own personnel who

⁶The italics were inserted by this author.

spent prolonged periods in prison camps during World War II tends to discredit the influence of vitamins on hearing. A former resident in otolaryngology at Stanford University Medical School happened to have served with the Navy at an advanced base just after the hostilities with Japan ceased. He examined approximately 2,000 prisoners of war as they



Fig. 1. Rabbit, left ear—vitamin A depletion. New bone (B) thickens the internal aspects of the periosteal layer of the otic capsule with some lengthening and narrowing of the internal meatus. The new bone contains islands of vascular connective tissue which appear to have ossified in the reversal experiments. The line of demarcation between the old and the new periosteal bone is rather distinct. (Courtesy of H. B. Periman, M.D., *Arch. of Otolaryngol.*, 50:22, July, 1949.)

were released from prison camps. Many of these had complaints and manifestations of vitamin deficiency diseases, but none of these included hearing changes. Examination of

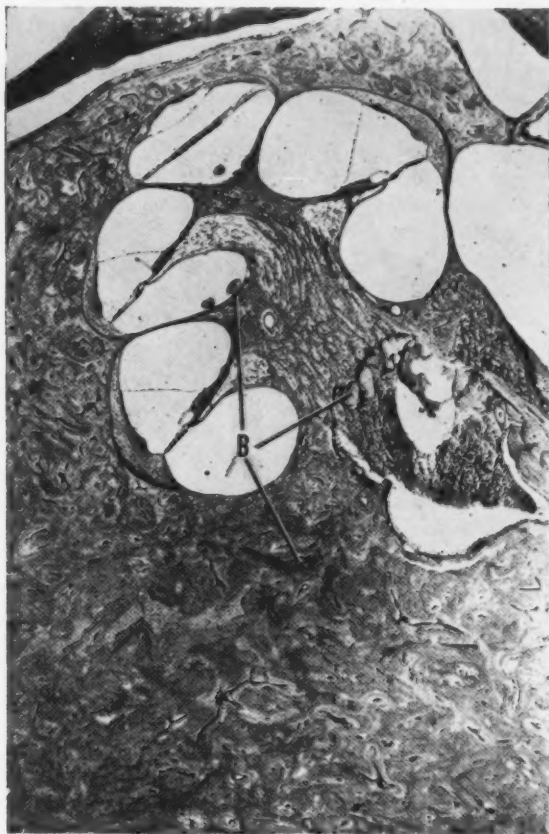


Fig. 2. Rabbit, right ear—vitamin A reversal. Widespread degeneration of cochlear nerve and ganglion, along with appearance of nodules of new bone (B) in the cribriform area and in the scala tympani. The periosteal and the enchondral bone are reorganized by dense bone, and there is hypertrophy of the posterior or intracranial layer. The nodules of new bone in the cribriform area probably encroach on the cochlear nerve and its vascular supply. (Courtesy of H. B. Perlman, M.D., *Arch. of Otolaryngol.*, 50:28, July, 1949.)

hearing by gross tests (whispered voice) revealed no deafness in any of these individuals.¹⁰

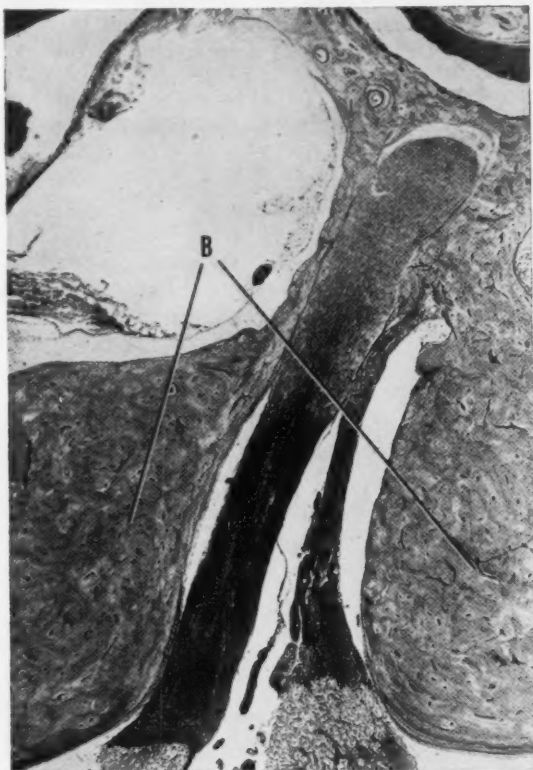


Fig. 3. Rabbit, right internal meatus—vitamin A reversal. The elongation of the meatus and the contained cochlear and vestibular nerve fibres is shown. The capsular bone is greatly thickened (B), but no connective tissue or fat marrow spaces are seen. There is no cement line of demarcation between the old bone and the newly proliferated bone of the capsule suggesting extensive reorganization of the capsule. (Courtesy of H. B. Perlman, M.D., *Arch. of Otolaryngol.*, 50:26, July, 1949.)

The summary of Lobel's report is as follows:

1. Fifty thousand units of vitamin A were administered by the intramuscular route twice weekly for an initial period of

six weeks. If favorable progress was observed at the end of this time, treatment was continued for an additional 22 weeks, or until tests showed that the maximum improvement had taken place. Patients who failed to respond to the therapy after five weeks (17 per cent) were excluded from the study.

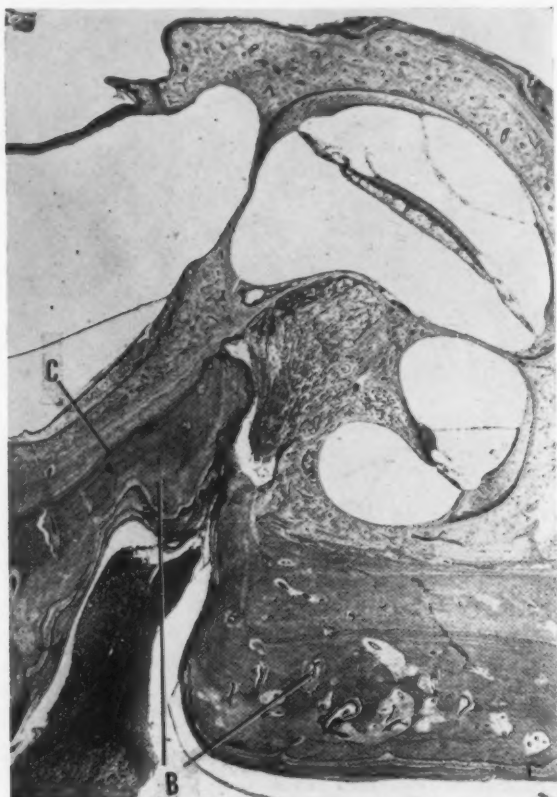


Fig. 4. Rabbit, right ear—vitamin A reversal. Note the new bone (B) in the internal meatus and along the posterior fossa. The neural elements of the cochlea are partially degenerated. There is no serous labyrinthitis. Islands of light-staining bone are probably the result of ossification of earlier connective tissue islands. The cement line (C) between the old and the new bone of the capsule is distinct. (Courtesy of H. B. Perlman, M.D., *Arch. of Otolaryngol.*, 50:31, July, 1949.)

After the peak effect had been reached, a period of three months was permitted to elapse before treatment was resumed;

2. Eighty-three per cent of his patients responded favorably to therapy after five weeks. (This figure was obtained by inference since it was stated that 17 per cent failed to respond after five weeks of therapy);

3. Prompt response to parenteral vitamin A therapy was more marked in the so-called catarrhal forms of deafness. In this classification was listed any conduction deafness, including otosclerosis. Perceptive types of deafness were slow to respond, but even in some of these favorable changes took place. Favorable effects were obtained also in the combined forms of deafness.

4. Annoying tinnitus was relieved and in some patients abolished following less than two months of therapy; relief was the rule rather than the exception after the first two or three weeks (no percentages were given).

PRESENT STUDY.

Method: The method was that of Lobel with slight variations. An attempt was made to give each case a minimum of 20 injections. Eight cases, however, received between 10 and 16 injections. Any case with 10 injections or over was considered a "completed" case.

The first 30 patients received 50,000 units of vitamin A with each injection. The last 16, after the third or fourth injection, were given 100,000 units of vitamin A with each injection.

The treatment was started in 45 patients but completed on only 36 (see Table 1). Of the nine incompleted cases, seven stopped treatment because of reactions which will be discussed later. The subsequent data, except for reactions, is based on 36 cases.

Sex: 21 females; 15 males.

Age: Nine to 72 years.

Types of Deafness:

- | | | |
|----------------|----|--|
| 1. Combined: | 9 | } 34 were bilateral
2 were unilateral |
| 2. Perceptive: | 10 | |
| 3. Conductive: | 17 | |

a. Other than otosclerosis: 6

b. Otosclerosis 11 (of these, five had not had surgery, six had had fenestration operations by me or elsewhere, three successfully, three without success)

Tinnitus: 17.

RESULTS OF TREATMENT.

Five patients showed an improvement in hearing of more than 10 db for the conversational range (frequencies of 512, 1024 and 2048 cycles per second), but only three, or 8.3 per cent, of these had improvement not explainable by other factors. The improvement was in but one ear in two cases and both ears in the third.

One patient (No. 35) showed a slight diminution in hearing.

Of the 17 cases having tinnitus, four stated that their tinnitus was less. It was abolished in none. One patient had transient relief, two were temporarily worse during treatment and two developed temporary tinnitus that was not present before treatment.

Of the 44 patients who started treatment, 15 had reactions, eight of which were slight and seven were from moderate to severe. The slight reactions were redness and itching at the site of injection and were controlled with antihistamine drugs. The moderate to severe reactions included itching, redness, induration at the injection sites, nausea, dizziness and headache.

Evidence of hypervitaminosis A⁷ was not noted. [This syndrome has been reported in infants and small children and

TABLE 1.

Name	Age	No. of Injections	Amt. of each Injection	Began	Ended	Ear	236		512		1024		2048	
							Before	After	Before	After	Before	After	Before	After
1. W. B.	62	19	1 cc (50,000 u)	8/5/48	10/26/48	Rt. Left	25 23	20 20	30 35	30 35	60 65	60 75	50 55	45 50
2. E. B.	55	22	1 cc	8/9/48	10/19/48	Rt. Left	15 30	10 20	10 25	15 20	20 65	10 65	10 55	5 55
3. Mrs. A. L. B.	70	36	1 cc	8/10/48	11/11/48	Rt. Left	45 25	35 40	30 35	45 30	45 55	35 55	65 65	70 60
4. D. C.	50	45	1 cc	6/8/48	12/23/48	Rt. Left	45 35	45 40	50 40	55 45	50 50	45 50	35 20	25 25
5. M. C.	38	20	1 cc	7/10/48	9/9/48	Rt. Left	25 60	20 55	35 65	35 50	50 70	55 65	55 70	45 60
6. D. T.	37	20	1 cc	6/8/48	8/20/48	Rt. Left	40 55	35 45	50 60	50 60	45 60	55 70	30 45	35 55
7. H. F.	58	36	1 cc	6/10/48	12/30/48	Rt. Left	30 65	30 35	25 60	30 35	35 70	30 30	25 55	25 35
8. M. J.	42	10	1 cc	10/14/48	11/19/48	Rt. Left	30 50	25 40	30 45	25 45	75 85	70 80	50 75	55 65
9. D. G.	26	15	1 cc	9/10/48	11/9/48	Rt. Left	25 15	25 15	30 15	35 15	70 55	80 55	60 55	60 55
10. E. K.	47	20	1 cc	7/27/48	11/17/48	Rt. Left	50 60	40 65	50 65	40 60	40 55	35 55	35 45	15 40
11. K. D.	46	12	1 cc	8/11/48	10/4/48	Rt. Left	35 5	35 0	40 -5	45 -10	40 -5	45 5	35 0	35 0
12. J. T.	65	72	1 cc	9/24/48	12/13/49	Rt. Left	35 22	12 15	30 20	13 10	30 25	20 15	20 25	15 25
13. C. O.	33	10	1 cc	11/4/48	12/10/48	Rt. Left	70 40	75 40	75 45	80 40	85 45	90 55	75 35	80 40
14. G. M.	63	20	1 cc	1/19/49	4/8/49	Rt. Left	25 25	20 10	30 25	45 15	45 40	35 35	40 35	45 55
15. A. W.	40	42	1 cc	2/21/49	6/29/49	Rt. Left	15 15	15 30	40 50	45 45	70 90	80 85	85 out	80 out
16. W. W.	70	14	1 cc	2/7/49	3/18/49	Rt. Left	35 30	30 40	40 45	40 70	75 70	70 70	70 65	65 65
17. Mrs. A. S.	55	12	1 cc	3/23/49	5/4/49	Rt. Left	25 35	30 40	40 45	30 40	45 45	40 30	35 35	25 30
18. M. C. L.	45	19	1 cc	4/25/49	6/29/49	Rt. Left	0 0	5 10	0 10	10 10	10 15	15 5	10 10	10 10
19. E. B.	38	19	2 cc (100,000 u)	6/9/49	8/8/49	Rt. Left	35 30	30 25	40 35	30 35	40 25	40 35	15 5	25 10
20. E. V.	39	19	2 cc	7/25/49	9/14/49	Rt. Left	85 50	75 55	95 60	90 80	80 50	80 50	75 35	70 35
21. R. K.	34	20	2 cc	12/8/49	2/8/50	Rt. Left	30 40	25 30	35 45	42 45	40 45	40 45	35 35	20 25
22. D. L.	33	20	2 cc	2/20/50	4/24/50	Rt. Left	25 30	25 30	35 30	25 30	40 30	40 35	10 10	25 15
23. E. P.	52	20	2 cc	4/13/50	6/19/50	Rt. Left	65 15	65 20	65 25	70 25	75 30	85 35	65 20	85 30
24. Y. M.	35	20	2 cc	1/16/50	3/27/50	Rt. Left	65 60	60 40	80 65	80 65	90 65	75 90	60 75	50 70
25. D. W.	35	25	2 cc			Rt. Left	30 35	30 40	35 45	40 50	43 40	40 50	20 25	40 45
26. E. L. N.	60	19	2 cc	2/7/50	4/12/50	Rt. Left	5 45	5 45	5 60	5 55	5 60	5 65	5 45	5 40
27. H.	33	20	2 cc	2/7/50	4/27/50	Rt. Left	40 40	30 35	35 50	45 45	40 45	40 40	35 30	45 40
28. V. S.	58	19	2 cc	4/13/50	6/16/50	Rt. Left	20 15	25 15	25 15	25 10	30 55	30 55	20 50	25 60
29. M. L.	42	16	2 cc	5/1/50	6/23/50	Rt. Left	10 15	10 15	10 10	10 10	20 10	10 15	15 10	10 10
30. Mrs. A. B.	46	19	2 cc	11/2/50	3/8/51	Rt. Left	30 30	35 20	30 35	35 30	50 50	45 50	25 40	20 30
31. S. R.	41	20	2 cc	12/12/50	2/20/51	Rt. Left	20 20	15 15	20 25	20 25	35 30	30 35	65 35	30 40
32. E. B.	53	20	2 cc	10/31/50	1/26/51	Rt. Left	65 50	65 40	70 40	70 45	80 60	90 60	95 70	85 60
33. R. C.	63	19	1 cc	3/11/49	5/5/49	Rt. Left	15 10	10 10	10 15	10 10	35 30	30 15	55 70	50 65
34. W. B. Jr.	30	15	1 cc	10/11/48	12/17/48	Rt. Left	15 10	10 0	10 10	0 5	10 15	0 15	5 25	10 30
35. Mrs. G. B. S.	43	20	2 cc	1/22/51	3/9/51	Rt. Left	100 55	85 55	100 65	100 60	100 60	100 70	100 50	100 65
36. M. A.	53	36	2 cc	1/30/50	6/20/50	Rt. Left	40 40	10 10	40 45	15 10	45 40	15 10	50 40	15 10

TABLE 1.

After	512		1024		2048		4096		Type
	Before	After	Before	After	Before	After	Before	After	
20	30	30	60	60	50	45	35	40	Percep-
20	35	35	65	75	55	50	35	35	tive
10	10	15	20	10	10	5	10	5	Mixed
20	25	20	65	65	55	55	35	35	
35	30	30	45	35	65	70	70	70	Percep-
40	35	30	55	55	65	60	70	70	tive
45	50	55	50	45	35	25	30	25	Otoscler-
40	40	45	60	50	20	25	15	15	osis
20	35	35	50	55	55	45	65	55	Otoscler-
55	65	80	70	65	70	60	70	60	osis
35	50	50	45	55	30	35	25	30	Otoscler-
45	60	60	60	70	45	55	40	40	osis
30	25	30	35	30	25	25	50	50	Mixed
35	60	35	70	30	55	35	50	40	Vertigo prevent Paget's Disease
25	30	25	75	70	50	55	45	40	Otoscler-
40	45	45	85	80	75	65	60	60	osis
25	30	35	70	80	60	60	65	75	Otoscler-
15	15	15	55	55	55	55	50	55	osis
40	50	40	40	35	35	15	30	15	Mixed
65	65	60	55	55	45	40	55	50	
35	40	45	40	45	35	35	35	35	Conductive
0	-5	-10	-5	5	0	0	25	25	rt. ear
12	30	13	30	20	20	15	45	45	Conductive
15	20	10	25	15	25	25	35	25	
75	75	80	85	90	75	80	65	70	Otoscler-
40	45	40	45	55	35	40	25	30	osis
20	30	30	45	35	40	45	50	50	Mixed
10	25	15	40	35	35	55	50	50	
15	40	45	70	80	85	80	out	out	Perceptive
30	50	45	90	85	out	out	out	out	
30	40	40	73	70	70	65	70	65	Perceptive
30	45	40	70	70	70	65	90	90	
30	40	30	45	40	35	25	40	30	Perceptive
30	45	40	45	30	35	30	35	30	
5	0	10	10	15	10	10	5	5	Perceptive
10	0	10	15	5	10	10	20	30	(slight)
30	30	40	30	40	15	25	40	40	Mixed
25	25	35	25	35	5	10	5	10	
75	95	90	80	80	75	70	75	30	Otoscler-
55	60	60	50	50	35	35	25	30	osis
25	35	43	40	40	35	20	20	25	Otoscler-
30	45	45	45	45	35	25	15	20	osis
25	35	25	40	40	10	25	50	50	Mixed
30	30	30	30	35	10	15	60	65	
65	65	70	75	85	65	85	70	85	Mixed
20	25	25	30	35	20	30	15	15	
60	80	80	90	75	60	50	90	85	Otoscler-
40	60	65	65	90	75	70	75	85	osis
30	35	40	43	40	20	40	55	60	Conductive
40	45	50	40	50	25	45	50	45	
5	5	5	5	5	5	5	0	0	Conductive
45	60	55	60	65	45	40	60	70	with vertigo
30	35	45	40	40	35	45	20	15	Otoscler-
35	50	45	45	40	30	40	30	15	osis
25	25	25	30	30	20	25	40	30	Mixed
15	15	10	55	55	50	60	45	45	
10	10	10	20	10	15	10	-5	-5	Mild
15	10	10	10	15	10	10	-5	-5	Conductive
35	30	35	50	45	25	20	10	10	Perceptive
20	35	30	50	50	40	30	10	10	tive
15	20	20	35	30	65	30	35	30	Mixed
15	25	25	30	35	35	40	30	25	
65	70	70	80	90	95	85	95	90	Otoscler-
40	40	45	60	60	70	60	55	60	osis
10	10	10	35	30	55	50	55	60	Perceptive
10	15	10	30	15	70	65	60	60	
10	10	0	10	0	5	10	65	65	Perceptive
0	10	5	15	15	25	30	50	55	
55	100	100	100	100	100	100	100	100	Perceptive
55	65	60	60	70	50	65	45	80	
10	40	15	45	15	50	15	55	15	Conductive
10	45	10	40	10	40	10	45	15	

Type of tinnitus	Tinnitus		Result	Remarks
	Before	After		
p-		None None	No improvement	
d	Violent	Violent	No improvement	
p-	Present	Unchanged	No improvement	Felt listless while taking shots; felt better when they were discontinued.
cler-		None None	No improvement	
cler-		None None	No improvement	No improvement in hearing but felt better.
cler-	Slight Slight	Unchanged Unchanged	No improvement	Her premenstrual "warning" symptoms, i.e. swelling of breasts, headache, feeling of depression, have disappeared.
d igo ent nt's ase	Present	Relieved for ten days	Improvement left ear	"Gets a sore throat one hour following injection for one day." States shots "more effective when given in arm."
cler-		None None	No improvement	
cler-	Present	Worse for short time but now unchanged	No improvement	Itching at injection site on one occasion.
d	"Pounding"		Rt. ear improved at 2048 and 4096	Thinks she can hear better.
ductive ar	Mild	Unchanged	No improvement	
ductive	Buzzing for awhile during treatment.		Improved	Itching at site of injection, first on buttocks then on arms. Felt better.
cler-	Present Present	Sl. imprv. Sl. imprv.	No improvement	
d		None None	No improvement	During treatment developed tinnitus, which disappeared.
ceptive		None None	No improvement	Thought she could hear slightly better.
ceptive		None None	No improvement	After 10th inj. said he "didn't feel good" and that he is dizzy.
ceptive		None None	Slight improvement	Did not think she heard better.
ceptive ht)	Marked Marked		No improvement	Injections given mainly for severe tinnitus which was not improved.
d		Present Present	No improvement	Thought hearing was improving. Felt better physically.
cler-	Present Present	Less Less	No improvement	Thought the injections reduced tinnitus and stopped his sneezing.
cler-		None None	No improvement	
d		None None	No improvement	
d	Severe Moderate	Severe Moderate	No improvement (worse)	Reactions at intervals at injection site. Controlled with antihistamines.
cler-		Marked Marked	No improvement (worse)	Slight local reaction following one injection. Controlled with antihistamines.
ductive		None None	No improvement (worse)	
ductive	None Marked	None Marked	No improvement	Tinnitus worse after 7th injection.
a vertigo	None None	None None	No improvement	Reaction (itching and red lump) after 4th injection. Controlled with antihistamines.
cler-		None None	No improvement	
d		None None	No improvement	
ductive	Transient Transient	Same Same	No improvement	Felt better.
ceptive	Occasional Occasional	Same Same	No improvement	Mild itching, redness both buttocks. Controlled with antihistamines.
d	For 4 weeks None	Improved None	Improved at 2048 (rt. ear)	Felt better.
cler-		None None	Subjective im- provement but none by audiogram.	Reaction after 13th injection controlled with antihistamines.
ceptive			No improvement	Felt better.
ceptive	Marked Marked	Same Same	No improvement	
ceptive	Intermittent Intermittent		Slightly worse	Slight reaction after 4th injection. Controlled with antihistamines.
ductive		None None	Improved	Felt very much better. Lost head tremor.



is characterized by anorexia, irritability, generalized pruritus, painful extremities, yellowish pallor, sparse coarse hair, dry scaly lips with bleeding fissures at the corners of the mouth, dry excoriated skin, general weakness, enlarged liver and subperiosteal new bone formation along the midportions of the shafts of the ulna, clavicle, femur and tibia, in that order. All these symptoms and signs apparently disappeared when the excess vitamin A (in doses of 400,000 to 500,000 units daily) was withdrawn from the diets.]

Seven patients thought that the injections made them feel better, in that they had more energy and less fatigue.

ANALYSIS OF REPORTS.

	Number of Cases	Per Cent Improved Hearing	Per Cent Improved for Tinnitus
1. Lobel	Approx. 300	83%	Not given
2. Anderson, Zoller and Alexander	30	50% (15 cases)	73.9% (17 of 23 cases)
3. Bau and Savitt	24	66.6% (16 cases)	66.6% (6 of 9 cases)
4. Baron	36	8.3% (3 cases)	23.5% (4 of 17 cases)

1. *Lobel*. His reports are given in percentages of gain in the frequencies of 510, 1024 and 2048 cycles per second and do not lend themselves to further analysis.

2. *Anderson, Zoller and Alexander*, who reported 15 cases of hearing improvement in their series of 30, have apparently determined this improvement by averaging the figures of all the frequencies of 256, 512, 1024, 2048 and 4096.

A breakdown of these figures to the average decibel gain for the conversational range (512, 1024 and 2048) only, reveals:

It is apparent that the cases in Group C fall within the range of normal variations so that there is considerable question as to whether they should be included in an "improved"

ANDERSON, ZOLLER AND ALEXANDER.

	Right Ear Decibel Gain	Left Ear Decibel Gain
Group A—7 Cases	16.6	0.0
	15.0	6.7
	6.6	15.0
	10.3	13.3
	3.0	12.0
	11.7	10.0
	11.6	5.0
Group B—3 Cases	5.0	10.0
	5.0	10.0
	10.0	0.0
Group C—5 Cases	Between 5 and 8.3	

series. The improvement in the B group is very slight, and the same may be said for a few cases in the A group.

3. *Bau* and *Savitt* have grouped their improved cases as follows:

BAU AND SAVITT.

Group B: 5-10 db gain—7 cases
Group C: 10-20 db gain—7 cases
Group D: More than 20 db gain—2 cases

In this series, too, the inclusion of the seven cases in Group B is open to considerable question.

4. *Baron* (see case reports).

Five patients out of 36 showed subjective and objective hearing improvement. Two of these (Cases 7 and 12) were excluded from the final calculations because of other factors related as follows:

Case 7: This is a man of 58 with Paget's disease of at least 10 years' duration. There was an improvement of 28.3 db in the left ear after 36 injections; however, he had shown an equal improvement in the right ear before injections were started. This man had had episodes of good and bad hearing. It is in such a case as this that the interpretation of the effect of any medication must be guarded. The comments of this patient following the injections were interesting. At the end of the third injection he stated that he "gets a sore throat an hour following the injection, which lasts approximately one day." The first eight injections

were given in the buttocks, the ninth was given in the arm. He stated that "the shots seem more effective when given in the arm." These remarks are further evidence of tremendous psychic factors which may be involved in any form of therapy, especially in that by injection.

Case 12: This 65-year-old lady showed a 10.6 db improvement in her right ear after injections, but she had already gained more than 10 db in her left ear by local therapy, such as reduction of her nasal congestion by local treatment, Eustachian catheterization and inflations and administration of the antihistamine drugs.

Case 31 was included in those with improved hearing with reservation since the only improvement shown was a 35 db gain in but one frequency (2048) in one ear. Such a gain is far from conclusive.

Case 36 (see Fig. 5) was the only one in the whole series of 36 that showed a dramatic change in her audiogram. This was a very tense, nervous woman of 53 who had a slight head tremor. There was some bogginess and pallor of her nasal turbinates and her nasal smears showed two plus eosinophiles. She was given an antihistamine drug and on several occasions her Eustachian tubes were catheterized and inflated. This resulted in no improvement in her audiogram. She was then started on vitamin A injections, 50,000 units each three times a week for two weeks and then 100,000 units twice a week. After the twentieth injection her audiogram showed a 25 db improvement in the right ear and a 23 db in the left. The patient developed a cold at about the time she finished her thirtieth injection, and an audiogram taken then showed that the curve had receded practically to the original level. Patient was given an additional six injections of 2 cc. each and then went on her vacation. Another audiogram taken two months later, or approximately six months after injections had started, showed a further hearing improvement of an addition 8 to 10 db. The total improvement since starting the injections was 33.4 db in the right ear and 30.6 in the left. Because of the spectacular improvement in the audiogram, it was decided to have the patient checked at the San Francisco Hearing Center. It is noteworthy that the tester there remarked, "The patient seemed nervous and ill at ease throughout the test." The audiogram done there showed a considerably lower level for both ears than ours done six days previously (see Fig. 6A). The reading showed an improvement of only 6.7 db for the right ear and 6.6 for the left. We again rechecked this patient four days later at my office and found that the audiogram was almost the same as the one we had done two weeks previously. I may state here that from time to time we have checked our audiograms with those of the Hearing Center and in most instances the two have run parallel.

Another thing of interest happened to the patient toward the end of her treatment. She lost her head tremor and became more relaxed. She said that she "felt very much better."

It is interesting speculation as to the *modus operandi* of the vitamin A in this patient's improvement. It seems apparent that it was not through a selective action on the cochlea. It seems more likely that the preparation, through its effect on the patient's well-being, removed the influence of the psyche upon the auditory mechanism. This patient became accustomed to going in and out of our office and was always relaxed and at ease when audiograms were done, whereas when she went to the Hearing Center she was anxious, nervous and ill at ease. This difference in mental state was able to produce an approximate 25 db difference in the audiograms on the two occasions.

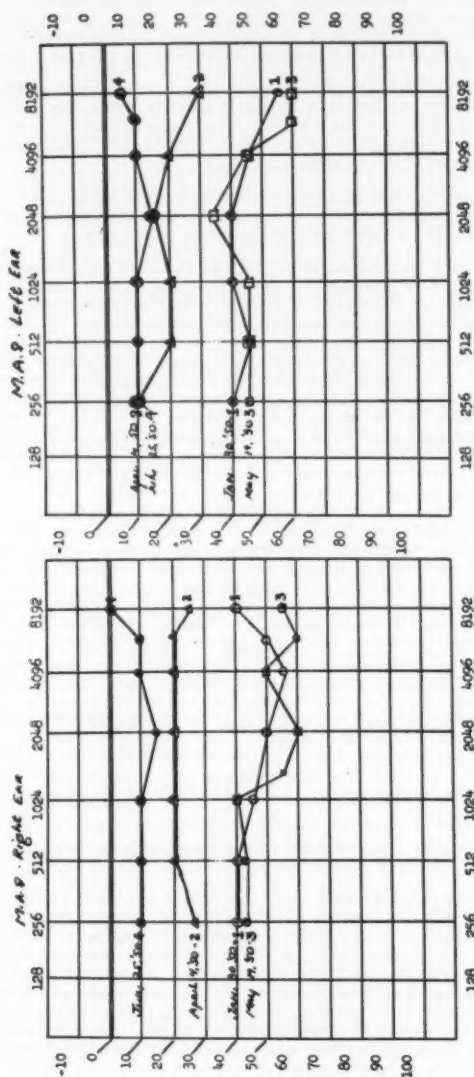


Fig. 5. Audiograms of Case 36. (1) Jan. 30, 1950. (2) April 4, 1950. (3) May 19, 1950. (4) July 25, 1950.

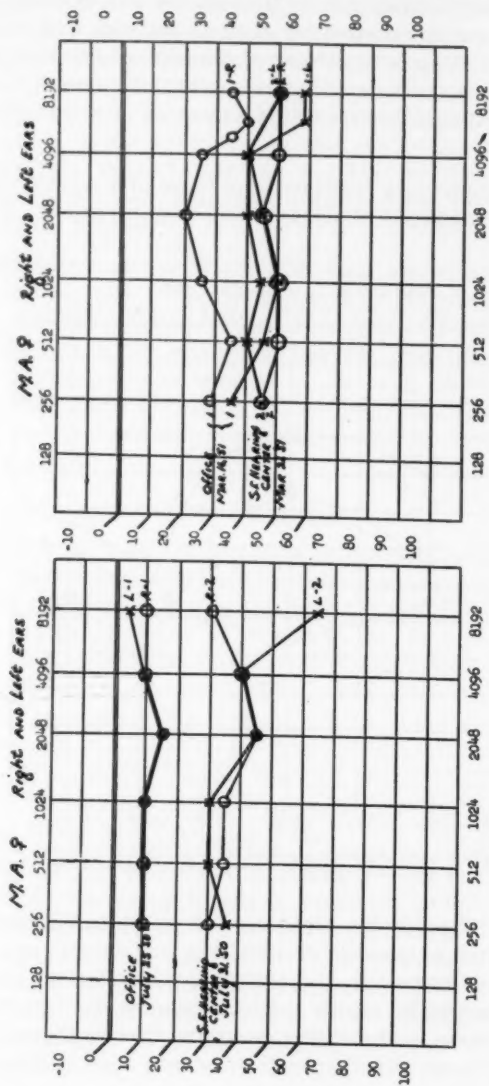


Fig. 6B.

Fig. 6A.

Fig. 6A. Case 36. Difference in audiograms done six days apart by different testers with different audiometers.
Fig. 6B. Case 36. Eight months later. Difference in audiograms done five days apart by different testers with different audiometers.

At this point I should like to present the audiograms (see Fig. 7) of a patient treated by another method, that of the aminoacid and vitamin treatment of Hirschfeld, Jacobsen and Jellinek.⁸ For a short period, as a matter of interest, I was alternating patients between this substance and parenteral vitamin A.

The audiograms just mentioned are those of a retired naval officer who complained of nausea, vomiting, occasional dizzi-

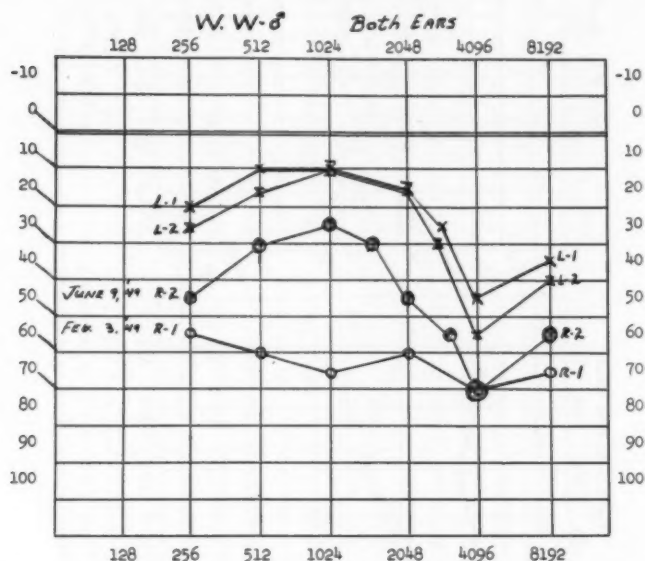


Fig. 7. Audiogram showing improvement in hearing in the right ear of a patient treated by another method (aminoacid and vitamin injections.)

ness and deafness in his right ear of about three months' duration. After a thorough examination was done to rule out any significant pathology, the patient was started on aminoacids and vitamins by mouth and by intramuscular injections. After about three weeks of this, he stated that he thought his hearing was worse. Another audiogram was done at this time

and showed a 35 db *loss* in his left ear and a 20 db gain in his right ear. Recheck examination revealed a low-grade suppurative maxillary sinusitis for which local treatment was given. In addition, the Eustachian tubes were catheterized and inflated at repeated intervals, and the administration of the vitamins was continued. At the end of three months the audiogram showed that the hearing in the left ear had returned to its previous level while that for the right ear had improved 27.5 db.

By chance of the "draw" this man was given injections of aminoacids and vitamins rather than parenteral vitamin A. The results from both probably would have been the same and an enthusiast for either medicament might have attributed the improvement in hearing to the drug. Actually, this improvement was due, likely, to the reduction of the inflammation in the nose and Eustachian tubes by the treatment of the sinusitis.

COMMENT.

It has not been my intention to discredit the conscientious reports of others who have had such glowing, favorable results in both hearing and tinnitus from the use of parenteral vitamin A. I did feel it a duty, however, to present the other side of the picture as shown by my experiences with the same therapy. Although the results of the various writers are three to one against me, it is difficult to understand why the patients in the east responded better than did those in the middle west, why those in the middle west did better than those in the south, or why the people in all sections responded better than those in the San Francisco area.

I doubt that vitamin A, presumably made more available to the body tissues by injection, produced improvement in any patient by a specific action on any portion of the auditory mechanism. It is conceivable that there may have been instances of improvement secondary to that of the upper respiratory mucosa in vitamin A deficient individuals in whom administration of vitamin A may have reversed epithelial changes.

A probable explanation for improvement in some patients was their increased resistance to fatigue, which is known to play an important part in loss of auditory acuity.⁹ Psychogenic factors have already been referred to and undoubtedly played a dominant rôle in many of these treated patients.

CONCLUSION.

The administration of vitamin A by intramuscular injection in a series of 36 patients having all forms of deafness and tinnitus coincided with improvement in deafness and tinnitus in very few of these cases. This injectable vitamin A has not, in my hands, shown a superiority over other varied forms of therapy presently available.

SUMMARY.

1. Results of the study of 36 patients with varying forms of deafness and tinnitus treated with intramuscular injections of vitamin A have been reported. There were but three patients with improved hearing and four with lessened tinnitus. (Two additional patients showed an improvement in hearing of more than 10 db but were not included because there were other factors which definitely contributed to this improvement. Table I shows other cases with an improvement of around 5 db which were not included because they fell within the range of normal error or variation.)
2. The experiences of others (three groups) have been reviewed. All reported results better than those in the series just presented.
3. The experimental work of Perlman revealed that the damage done to the internal ear by vitamin A depletion was not reversed by vitamin A excess.
4. Vitamin A administered intramuscularly for the treatment of deafness and tinnitus in this report showed no superiority over other forms of therapy presently available.

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**BULBAR POLIOMYELITIS:
A RESPIRATORY PROBLEM.*†**

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Further experience with bulbar poliomyelitis has confirmed our previous conviction that secretional obstruction, anoxia and carbon dioxide accumulation are much more important in this disease than the direct action on the vital centers of the virus itself;¹ and we believe more firmly than ever that proper treatment based on that idea can prevent many more deaths in this disease. Because some men speaking with authority and basing their conclusions in part on laboratory rather than clinical data are still skeptical, it seems worthwhile again to present the reasons for that concept, the treatment dictated by it and the results of that treatment. Men with experience with respiratory obstruction seem easily to see the logic of these ideas; some others cursorily dismiss them with little to offer in their place.

Bulbar poliomyelitis has many factors in common with other respiratory obstructions. Some of these are: the identity of many symptoms with those of anoxia and carbon dioxide excess; the rapid worsening at a critical level after a period of relatively moderate difficulty; the rapid amelioration of such symptoms when the airway is cleared before the stage of irreversibility is reached; the large percentage of recoveries based on treatment directed to the relief of obstruction.

Treatment based on this belief resulted in no mortality in 12 successive patients with pharyngeal paralysis treated early

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under good control at the Evanston Hospital in 1947 and 1948 (see Table 1). At the same time in Illinois, outside of Chicago, the mortality was 38.8 per cent in 105 bulbar cases. Some more recent cases were unfavorable because they were transported greater distances and were seen later, but our

TABLE 1.
MORTALITY IN BULBAR POLIO.

Locality	Years	Total Polio	Bulbar and Bulbar Spinal	Bulbar and Bulbar Spinal Deaths	Bulbar and Bulbar Spinal Rate
Evanston Hospital	1947-48	127	15*	0	0
Evanston Hospital	1947-50, incl.	314	63†	10	12.8%
Chicago Residents	1948	312	37‡	10	27
Illinois, outside Chicago	1947-48	1,242	105	39	38.8%
Illinois, outside Chicago	1947-50, incl.	5,018	722	277	38.3%

*Three of 15 had no pharyngeal paralysis.

†Twenty-five had tracheotomies.

‡Of 12 additional bulbar cases originating outside Chicago, nine died.

four-year mortality, 1947-1951, was 12.8 per cent in 63 bulbar cases, while at the same time the mortality in Illinois was 38.3 per cent in 722 bulbar cases. Our series is small statistically, but Prof. H. T. Davis estimates that the probability of such results occurring by chance was not more than six in 10,000. When the same general principles have been followed as by Bower³ and his group at Los Angeles and by Priest, Boies and Goltz⁴ the results were generally considerably better than the national average.

For the understanding of bulbar poliomyelitis as a respiratory problem it is necessary to consider: 1. the effect of anoxia and carbon dioxide accumulation and 2. other effects secondary to respiratory obstruction.

Anoxia is used in its accepted sense to include carbon dioxide excess. How quickly it may produce disaster is still not widely appreciated. We have shown elsewhere⁵ that 60 seconds of anoxia may produce morphologic changes in the

brain; that in three to eight minutes it may produce widespread damage, necrosis or even death; that anoxia superimposed on previous injury or infection may have a much more deleterious effect. It has also been shown that though the patient lives, serious lasting emotional, mental and motor disturbances may persist.

Much more important than oxygen lack is carbon dioxide accumulation. Gray⁶ states that a level of diminished ventilation to provide the hypoxia equivalent to about 10,000 foot altitude, which itself would produce almost no distress, would result in a carbon dioxide tension of 80 mm. of mercury and a lowered pH approaching a narcotic effect—and moderate increase over that could be lethal. This should emphasize that mere administration of oxygen cannot take the place of clearing the airway so necessary for elimination of carbon dioxide.

The symptoms of anoxia (including carbon dioxide accumulation) are important to remember in the mixed clinical picture because their recognition not only gives a truer picture of the relative importance of central virus infection and peripheral respiratory difficulty, but they are also the best indication for active treatment.

At first there may be headache, excitement or even euphoria followed by confusion, disorientation, irrationality, lethargy and finally coma. Antagonism and uncooperativeness occur often, may lead to misjudgment of the patient, and require aid not dependent upon the patient's cooperation. Restlessness occurs rather early, makes more demands on the oxygen supply, and may lead to the serious mistake of sedation. One patient was ordered into restraints when he needed tracheotomy. Dyspnea may be easily overlooked in the presence of other grave symptoms. Cyanosis is hard to assess, but if marked in slowly developing obstruction is likely to be a late symptom of imminent cardiac failure.

Not to be overlooked are the secondary effects of secretional obstruction just as those of other obstructions at the laryngeal or tracheal level.⁷ These may involve the whole lung, lobe or lobule. There occur in order congestion, stasis, edema,

transudation and, if this is not relieved, increased negative intrathoracic pressure, exudation, plugging, atelectasis, with emphysema; and with secondary infection pneumonitis and so-called atypical pneumonias so commonly found in patients dying of this disease.

Attempts have been made to predicate pulmonary edema, which is such a serious complication in bulbar poliomyelitis, on a central neurologic basis. Polley⁸ has rather definitely shown that it occurs in bulbar polio because of an obstructed airway, with or without the respirator, and increase of hydrostatic pressure plus the action of anoxia and carbon dioxide in increasing capillary permeability. Our experience coincides with his conclusion that a cleared airway is the greatest protection against pulmonary edema, and that it must be prevented, because once established, it is a very serious and almost irreversible complication.

The chief objection to the ideas here presented seem to depend upon histologic evidence that in bulbar poliomyelitis there is widespread damage to cells in the medullary centers as well as other parts of the brain and spinal cord. It is extremely difficult, however, as Bodian^{8,9} has pointed out, to correlate such findings with the clinical symptoms. Bodian said, "Correlation of lesions in the brain stem with symptomatology must be largely speculative." Neuberger¹⁰ and others have suggested that some brain damage is due to hemorrhage and anoxia.

Magoun,¹¹ who has studied the reticular substance intensively in polio, is willing to entertain the hypothesis that in nuclei injured by edema, cell debris and capillary damage, gas interchange is blocked so that they are more susceptible to anoxia as suggested by Kubicek.¹²

Against the idea of primary central effect is the usual experience that most patients who recover from bulbar polio do not have persisting swallowing or respiratory difficulty unless the spinal nuclei controlling diaphragm or intercostals are affected. Medullary respiratory depression does occur to

a degree often requiring use of the respirator, but this is usually partly or wholly relieved after anoxia is relieved. Bower³ states that most of the so-called central arrhythmias likewise clear up after acidosis is remedied.

Material of the pathologist comes from patients who died with anoxia — if not because of it. Others who certainly faced that outcome with symptoms going from lethargy to coma, and early vasomotor and respiratory collapse have been decisively saved by treatment from imminent death and thus furnish no pathological refutation. Nothing in *a priori* reasoning seems to match the evidence given by the abrupt change in clinical course produced by clearing the airway. Six of the 12 consecutive patients with bulbar polio who did not die surely would have done so, and quickly, without such intervention.

To hold that the severe effects in bulbar poliomyelitis are due only or even chiefly to overwhelming virus infection of vital centers leads to defeatism and a negative approach to treatment that offers little or no help in the disease. Even if some of the views herein expressed prove later not to be wholly true they offer at present about the only working hypothesis of promise. They will hardly be dismissed without trial as oversimplification by a group who know the problem of respiratory obstruction and the satisfying methods of its relief. In any event, obstruction does exist in these cases from secretion and spasm or paralysis of larynx and pharynx and must be corrected if these desperately ill patients are to survive.

Three clinical types of respiratory difficulty are generally recognized in acute poliomyelitis:

1. Spinal paralysis affecting intercostals and diaphragm. These patients fall easily into rhythm of the respirator and do well in it, but may be permanently disabled.
2. Bulbar paralysis.
3. Bulbospinal.

Disturbances in rhythm, depth and coordination have been ascribed to infection of specific respiratory nuclei in the medulla. Such effect can occur but we believe it rare. We believe such disturbances are most often a result of conflict between ventilatory demand and protective mechanisms to prevent self-drowning, plus the effect of anoxia and carbon dioxide on the medulla. We believe this because we have seen the irregularity abolished by pentothal sodium (with serious results) and because it usually disappears on clearing the airway if not done in a terminal stage.

After tracheotomy and the respirator, our first patient seen with bulbar poliomyelitis went from coma, extreme cyanosis, imperceptible pulse and arrest of respiration for three minutes to rationality, normal color and pulse in 45 minutes. We have had so many patients with almost as marked recovery in as a short time that it is hard to believe that the condition could have been due to anything but asphyxia. Certainly such a rapid course does not seem compatible with any known type of infection.

In bulbar polio conditions are almost ideal for the production of anoxia. Due to inability to swallow, 1,500 to 2,000 ml. of saliva per day plus inflammatory secretion and food or vomitus may accumulate in or over the airway. We have recovered by aspiration over 2,200 ml. in 24 hours. This fluid mechanically impedes air flow, produces spasm of the larynx and tends to be drawn in with inspiration, especially in those instances where the paralysis destroys the protective function of the larynx. Flooding may occur because in the ordinary supine position the declivity of the tracheobronchial tree is from 17 to 20 degrees so that secretion flows with gravity or is easily drawn into the lung bed.

It has been common in our patients to find considerable accumulation of secretion in the pharynx, trachea and bronchi along with symptoms of anoxia. It has also been the rule that unless anoxic symptoms have persisted too long, they are relieved relatively soon after clearing the airway. The symptoms of medullary depression have usually followed milder

symptoms of anoxia and also are usually relieved by clearing the airway, suggesting as Bower³ states, that this is due to acidosis or anoxia.

We believe, then, that the primary difficulty in bulbar poliomyelitis is difficulty with the swallowing mechanism with accumulation of secretion and food and vomitus in or over the airway. Cough and other expulsive mechanisms are ineffective and unless fluid is kept removed by treatment it will lead to anoxia by preventing ingress of air, by producing laryngeal spasm, by blocking bronchioles, and by flooding and secondary damage to the respiratory area of the lungs.

In 1929, J. I. Durand¹³ observed that in his opinion "many polio deaths are due to drowning as many men must have observed," and he made the very vital recommendation for postural drainage. The analogy is good, since except for speed the two processes are very similar. As Motley¹⁴ points out, laryngeal spasm is often a very important factor in the suffocation of drowning. It has seemed that spasm may be important in bulbar poliomyelitis and that it is more likely to be a factor than obstructive median paralysis of the vocal cords. We are not sure we have ever seen this in polio. Also, as Furstenberg¹⁵ has pointed out, nuclear or infranuclear paralysis of the cords is flaccid and not spastic. Sjöberg¹⁶ postulates that a combination of spasm and paralysis of tongue and pharyngeal muscles with the head extended blocks the airway, although we have not been able to note that in obstructed cases.

The comparison to drowning is useful since the time element may be as short and the moment for action may as quickly pass. Seconds count in any form of asphyxia. Ignorance or indecision and inertia may hold to stupid inaction a man who would without hesitation leap into a raging torrent to save a child in hardly graver danger.

Treatment of these cases may be relatively simple or hopelessly involved. If undertaken early, decisively and with a visualization of the problem, it usually offers little difficulty

although it requires meticulous and unremitting care. If delayed by lack of opportunity or indecision, it may require the utmost in experience, skill, team work and equipment. The simpler class of cases should be cared for by any well trained otolaryngologist with the aid of a good medical man or pediatrician if he gets an early chance, although decisions are made too frequently without consulting him by men who have not the experience or imagination to understand the problem.

Postural drainage and continuous suction, best obtainable by a Venturi type pump, are in our opinion the most important steps in treatment. When the patient first gives evidence of pharyngeal paralysis by muffled voice and inability to swallow secretions, even though he can apparently cough or push them out of his mouth, he should be placed with the feet elevated and the neck extended so fluid may accumulate as in a sump, at the nasopharynx or hypopharynx where it may be picked up as quickly as it covers the opening of a perforated rubber tube connected to continuous water suction. Remembering the few minutes of anoxia necessary to produce irreversible damage, it must be obvious that dependence cannot be placed on intermittently applied mechanical suction. We know of no mechanical apparatus which will bear constant use except one attached to a vacuum tank. The device pictured (see Fig. 1) is easily attached, effective in the pressure desired, almost foolproof and does not get out of order. Some plumbing codes interdict its use, yet if it is connected to a half liter collecting bottle filled with antiseptic solution, contamination of the general water system seems impossible.

Thirty years of experience with postural drainage in respiratory obstruction, especially in acute infectious tracheobronchitis, has persuaded us that it is of the utmost value and without danger if used early. Lateral X-ray with radio-opaque oil outlining the tracheobronchial tree² indicates that elevation of the foot of the bed in the supine position must be at least 17 to 20 degrees to prevent flow of secretion into dependent lung bed. We have advocated 35 degree elevation but now believe that extreme, and seldom obtainable. Twenty-

three to 5 degrees is usually satisfactory. If the patient will lie prone with the head to the side, as usually only infants will do, drainage is effective and normal physiology is not disturbed. Adults may comfortably maintain such position if sustained by special sponge rubber pads.¹⁶

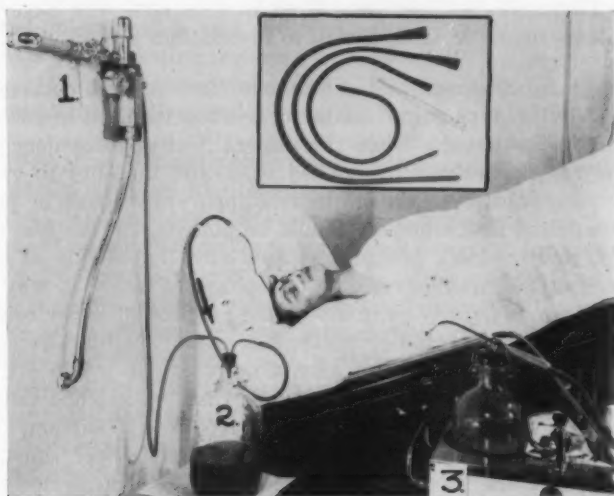


Fig. 1. (1) Is water suction (supplied by Surgical Mechanical Research, 1905 Beverly Boulevard, Los Angeles 4, Calif.) fixed to the wall, connected by fairly stiff tube to collecting bottle (2), this to catheter through patient's nose to the pharynx. (3) Is a standby mechanical suction. Beveled and whistle tip catheters are shown in inset.

Bower and his group³ have raised a question as to the safety of the Trendelenberg position in seriously ill patients. At 15 degrees' elevation for 15 minutes the average drop of tidal air was 20 per cent. This, however, left an average tidal air of over 300 ml. on which a patient at rest may be carried, especially if adequate oxygen is given. This objection does not seem to outweigh the great benefit of postural drainage, which helps insure that the lower airway is not flooded, the alveolar area is accessible and the absorption of oxygen and excretion of carbon dioxide well distributed throughout func-

tional lung. It is doubtless true that in patients with marked vasomotor disturbance caution must be used against extreme position.

Fluids and nutrition are maintained parenterally while there is any danger of flooding the airway. It is especially important that electrolyte balance is strictly maintained. Bower and his group have pointed out that potassium deficiency is likely to occur in polio with loss of sodium balance and also with weakness of the cardiac and respiratory muscles. This may be very important, as shown recently by Darrow and Pratt.⁸ This may arise from cell destruction, from acidosis, and probably through saliva lost. Potassium can be given intravenously with safety only with careful blood studies, which are hard to secure; however, it can be given subcutaneously with relative safety in Darrow's solution. The proper concentration will be picked up through the gastrointestinal tract if given by mouth. For this reason early feeding through a tube to the stomach is advocated by the Los Angeles group. This also permits aspiration in the not infrequent gastric hemorrhage. On account of the danger from vomiting, we still choose to use only parenteral administration of fluids, glucose, electrolytes, vitamin C and B complex and protein hydrolysate until patients can swallow, although if tracheotomy has been done, tube feeding is not especially dangerous, since regurgitated fluid is then less likely to be aspirated.

Prevention of avitaminosis and hypoproteinemia are essential for recovery from tissue damage, to prevent pressure sores and to promote healing of tracheotomy or other incisions. Proper hydration is especially important to keep secretion thin and easily removable. Excess of fluid may promote cerebral or pulmonary edema, but allowance must be made for the 1,500 ml. or more lost by saliva, regurgitation and other secretions.

Tracheotomy was first suggested for this condition by Wilson,¹⁰ in 1932, but only in recent years has it come to be widely accepted. The visualization of conditions making it neces-

sary, its precise indications, its harmlessness and frequently lifesaving necessity are well appreciated. Probably its most important benefit is the short circuiting of pharyngeal secretion and the prevention of aspiration as shown in Fig. 2. The suctioning of the secretion already aspirated through the

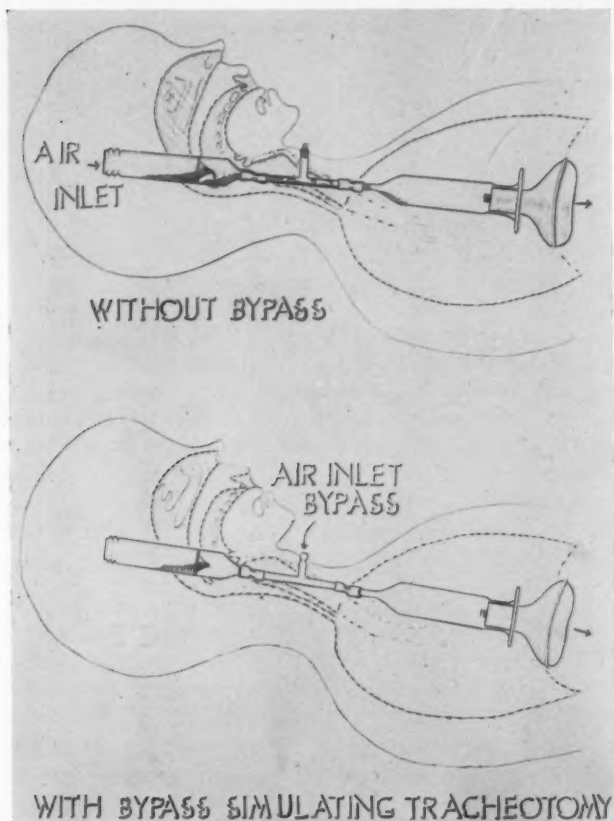


FIG. 2. A model to simulate the effect of voluntary breathing or a respirator when there is fluid in the upper airway. With moderately viscid fluid, intravenous tube, T tube and aseptosyringe it acts as shown. When the by-pass is open no fluid is drawn in—illustrating the effect of tracheotomy. (Reproduced from Archives of Otolaryngology, 46:125, Aug., 1947.)

tracheotomy wound, and the provision of a clear airway are especially valuable. Since widespread use was advocated in 1943¹ with an attempt to rationalize this procedure statistics of large numbers of operations by Priest, Boies and Goltz,⁴ by Bower,³ and others have shown its great value and freedom from danger. Our indications as previously stated are:

1. Progressive anoxia with secretion in the airway.
2. Coma or other sign of anoxia without relief in a few minutes.
3. Marked restlessness or stupor in a patient already in a respirator.
4. Difficulty with secretion in a respirator patient.
5. Bilateral spasm (or paralysis) of the larynx.
6. Rapidly progressive bulbar symptoms, usually due to anoxia and carbon dioxide.
7. Untrained attendants, inadequate equipment or poor co-operation with any doubt that the airway will be kept free of secretions.

Reasons for these indications were discussed in earlier papers.

We are not quite ready to recommend routine prophylactic tracheotomy if the clinician is prepared to intervene at any moment and realizes how rapidly such patients can fail. It is much better to do tracheotomy unnecessarily in many cases rather than too late in a single one, and too early rather than after irreversible damage. We have seen no important complication from the operation, nor any case in which it contributed to an unfavorable outcome. It is not to be withheld as it is too often for the last forlorn hope. It should be done more often with a physician's first experience with the disease as much greater skill, training and equipment are required to carry on without it. It should be done high, through the second interspace and third tracheal wound to permit use of the respirator.

Postoperative care of tracheotomies is especially important since in these patients cough is impaired or absent, especially if they are in a respirator. Great gentleness to avoid trauma is required. While continuous water suction is continued through the nose, intermittent suction is used through the tracheotomy tube, removing the inner cannula if necessary. A soft whistle tip catheter is gently used or a soft rubber catheter obliquely cut and smoothed in a gas flame with a small counter opening near the end to break excessive grasp of mucosa, while permitting removal of secretion or plugs. Dew point humidification, use of wetting agents, gentle irrigation with warm 3 per cent soda bicarbonate solution followed by normal saline, both removed by suction in postural drainage will usually prevent atelectasis and prevent the need of bronchoscopy. Forceps technique is employed for asepsis, antibiotics are used but not long enough to permit the overgrowth of monilia and other fungi.

Treatment at the Evanston Hospital, which gave no mortality in 15 consecutive bulbar polio cases, and an allover mortality of 12.8 per cent for four years, is outlined:

1. Postural drainage with continuous water suction instituted at beginning of swallowing difficulty.
2. Parenteral fluids, electrolytes, vitamin C and glucose followed after the third day with intravenous B complex and protein hydrolysate or amino acids.
3. Oxygen administration, but as an adjunct to clearing the airway and eliminating carbon dioxide.
4. Tracheotomy when signs of anoxia persist or develop in spite of above.
5. The respirator when respiration is depressed from anoxia, exhaustion or any other cause.
6. Antibiotics against infection (but not to the point of overgrowth of fungi, which may explain some troublesome exudates).

Such treatment could easily be adopted by any member of this group and should be usually effective if opportunity were given early.

Certainly even without special experience with the disease these measures are to be preferred to special apparatus which perhaps places wrong emphasis and delays proper measures. Some of these need special discussion as some are very valuable, especially in serious cases.

Oxygen is of proven value in respiratory obstruction. It should, however, be emphasized that much more important are the measures taken to provide for the elimination of carbon dioxide. A clear airway is the prime need and no special device to provide oxygen should divert attention from this.

The oximeter has been proposed to determine oxygen need. It needs to be set against a normal base, is not a thoroughly reliable apparatus, gives no direct indication of carbon dioxide excess and in our experience is only of value in determining when a chronic respirator patient may leave the respirator.

The electrophrenic respirator has some value in emergencies but does not have the applicability or dependability of the tank respirator. It is not well tolerated for long periods and does not seem to warrant the emphasis given it. Bower²⁰ tried the method and discarded it as impractical.

Various portable respirators are of definite use in doing tracheotomy and in weaning the patient from the tank respirator. They do not yet have the dependability or efficiency of the tank respirator.

The rocking bed seems to have proven of real value in making the convalescent patient independent of the respirator and shortening the transition period weeks or more.

Attempts at determination of chemical acidosis in our experience have not replaced careful clinical observation. Respiratory acidosis, as pointed out by Gamble,²¹ gives oppo-

site blood findings from those of metabolic acidosis and must be interpreted in the light of blood pH and compensatory mechanisms. To be significant, tests must be done on alveolar air, here impossible, or on arterial or capillary blood. We have obtained little value from them in individual treatment but they are very important for research.

The Los Angeles group, under the lead of Bower and Bennet, have designed a number of mechanical devices which careful physiologic studies indicate have much promise. Unfortunately they are only now becoming generally available and we have had no opportunity to use them.

They include 1. The Bennet ventilation meter which aids in determining the setting of the respirator. It also shows when dangerous lessening of the tidal air indicates additional help by tracheotomy or the respirator. 2. The positive pressure attachment which synchronizes through mask or tracheotomy with the negative pull of the respirator.

Some physiologists insist that in any case the true value of the negative pressure is the same as the algebraic sum of combined positive and negative pressure, but the Los Angeles group believe it definitely beneficial in more wide inflation of lungs and prevention or relief of pulmonary edema and atelectasis; and they found that usually a smaller total pressure is required and is better tolerated by the patient. Motley agrees that it is useful.

3. The flow sensitive breathing units appears to be valuable as for emergency use, especially tracheotomy, which can then be done out of the respirator. It also provides useful positive pressure for use in pulmonary edema. This is in accord with the ideas of Barach and the Committee on Inhalation Therapy.²¹

4. The cam adjustment appears to make a more comfortable and normal timing of the respiratory cycle.

The question of transportation of bulbar patients requires special consideration. Such patients are better treated in hos-

pitals properly equipped, by teams properly trained, since some patients may first be lost while experience is being gained by a group to whom the problem is new. Travel and strain are so injurious to these patients except at the beginning of bulbar symptoms that they might do better if intelligently treated locally.

Polio in pregnancy is a special problem with a rather unfavorable experience until lately. The gravid uterus near term distends the abdomen, interferes with respiratory movements, embarrasses the heart and makes postural drainage poorly tolerated. If early preliminary tracheotomy is done, and the uterus emptied by Caesarean section, these patients seem to respond quite well.

CONCLUSIONS.

1. We believe that the idea that the serious effects in bulbar poliomyelitis are due to overwhelming infection of the vital centers is usually not justified.
2. Considered as a problem in secretional obstruction with anoxia and carbon dioxide accumulation, it lends itself to treatment that should be favorable in most cases.
3. This is a problem for a team of which the laryngologist should be a full member. He should see the patient at the first sign of difficulty in swallowing or of anoxia.

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PRACTICAL PROBLEMS IN THE USE OF CORTISONE AND ACTH.*

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Philadelphia, Pa.

I present this paper as an "athologist." In attempting to present to a group of specialists in diseases of the ear, nose and throat the most important facts concerning cortisone and ACTH I was much perplexed, since importance is such a relative thing. What is of particular importance to you in this tremendous discovery of the effects of the pituitary adrenocorticotrophic hormone (ACTH), or in an adrenal hormone as cortisone or the soon to be released compound F in various disease states? The smoke from this tremendous explosion in medicine has still not cleared away, but there are several points that I would like to discuss: First, these potent hormones produce a marked change in the entire body. They are master hormones. They are the hormones which control our resistance, which control our reactions to stresses of all types. They don't cure diseases, but they block the harmful reaction in many cases. For example, they produce a changed reaction to infection. Our rheumatoid arthritics very rarely have colds, because they are in a nonspecific hyperimmune state. They develop colds repeatedly and severely while on ACTH or cortisone, so we realize that one of the effects of these hormones is to change the mechanism of immunity. That is quite obvious since we have known physiologically for some time that the pituitary adrenocorticotrophic hormone acting through its effect on stimulating the adrenal hormones (cortisone particularly) causes a lysis of lymphocytes, a release of antibodies and thus a decrease in the amount of immune bodies. Now that effect on resistance to infection, naturally, is important

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to all of us in medicine. If we use cortisone, we must remember that a secondary infection can occur. Another effect which is brought to mind is the fact that the formation of fibroblasts, the formation of fibrosis in healing, is impeded by the action of these hormones. ACTH acts only through the adrenal by stimulating release of cortisone. Many times I will refer to cortisone meaning either hormone. The resistance to the effects of trauma is also changed in a similar way by a delay in healing of fibrous tissue. Conversely, that may have a beneficial effect in slowing the stenosis developed from large scar formations. This may have tremendous importance in surgery but has not yet been fully worked out. Actually, we may generalize by saying that the effect of these hormones in the conditions for which we are using them is much like that of pyribenzamine or similar antihistaminics in hay fever: it suppresses the reaction; it does not affect the cause. It is important also to realize the basic physiological changes induced, so that we do not use cortisone for a trivial process. It is really driving a tack with a sledge hammer. Here is a two-edged sword, one that is going to change our entire body physiology. Cortisone should not be used for trivial conditions, but should be saved as the "ace in the hole" for serious trouble.

I am not going into great detail regarding the complications, reactions and the methods of administration of cortisone and ACTH. These are enumerated quite well, I think, in the package circulars and in pamphlets that are easily available. The basic contraindications to the use of these hormones are worthy of consideration. On a patient in cardiac decompensation, the effect of cortisone or ACTH is an increased retention of sodium and fluid, and a loss of potassium. Edema is the most common complication; consequently, in cardiac decompensation we would have a great deal of difficulty from increasing the load. This is one of the great contraindications to cortisone. Another great contraindication is renal failure. We have seen some cases that have actually been thrown into uremia by the administration of ACTH or cortisone and, of course, again it may be due to the sodium

retention, or it may be some actual effect on the kidney, the details of which are still not worked out; in fact, we do not know how these hormones act at the tissue level.

We are dealing with products which cause a definite immediate effect in many conditions. It has been facetiously suggested that we should regroup diseases; those which respond to ACTH and cortisone and those which respond to antibiotics. As I said before, it doesn't cure any of them, but the self-limited conditions which are severe during their course may be greatly relieved. We must regard these as agents for immediate relief, and often very dramatic relief, but they must be continued much as the diabetic is kept on insulin, to produce a consistent effect in chronic conditions. The rate of recurrence in anything but self-limited conditions, such as penicillin reactions or even acute rheumatic fever perhaps, is almost 100 per cent in our experience.

I will now discuss some of the local effects on the ear, nose and throat. In asthma, particularly severe and intractable asthma, status asthmaticus, ACTH has a dramatic alleviating effect. When gradually decreased to the so-called maintenance amount, starting with perhaps 100 mgm. or 120 mgm. of ACTH a day, given in divided doses and then reduced, a patient can be pulled out of a severe status asthmaticus to sleep and breathe perfectly freely for the duration of the administration. The Hopkins group has been quite optimistic about the end-results on this and find very few relapses. In our own group at the University of Pennsylvania the relapse rate after the ACTH or cortisone is discontinued is quite high, so that we must continue a maintenance dose on cases serious enough to require it.

Effect on Hay Fever. Randolph, of Northwestern, at the ACTH conference in Chicago last year reported the dramatic alleviating effect of ACTH on hay fever. Again I want to emphasize the point that here we are driving a tack with a sledge hammer. We have other agents that relieve it, and I leave it to your own judgment whether ACTH should be used in hay fever.

Nasal Polyps. The Hopkins group have studied these with some detail and find that they are shrunken when the drugs are used in adequate amounts. The airways are opened, and there is a definitely alleviating action; however, in my small experience with nasal polyps, I find that surgery is far superior. When ACTH is discontinued, the polyps again return to their original size.

The question of lymphoid collections in the pharynx is rather important, I believe, since we know that these hormones have a definite shrinking action on lymphoid tissue generally. When there is marked lymphadenopathy the size of the nodes will decrease rather markedly when these hormones are used. Whether or not this is actually a beneficial effect remains to be proved. I think it suggested itself that it would be of benefit in trying to shrink the persistent lymphoid collections in the throat. Not being an otolaryngologist, I would not say definitely but it is my impression that here again we must think about the sledge hammer. I believe that local treatment should be far superior. Dr. Harvey and his group at Hopkins have reported that they found a moderate shrinking of lymphoid tissue and a change in the color of the lymphoid tissue with loss of the edema. After the drug is stopped these tissues return to their previous appearance, and there is often a rebound phenomenon in which the condition is temporarily even worse than it was originally.

There has been considerable confusion in the use of these hormones in infectious states. The use of ACTH in early tuberculosis has been recommended. It does break down the fibrosis which walls off pulmonary tuberculosis. In our own experience, sadly enough, tuberculosis can be lighted up quite severely by giving ACTH. We had one patient who had apparently an arrested T.B. On ACTH, given for rheumatoid arthritis, he had a severe flare-up with bilateral spread. The patient was naturally taken off the ACTH and is now improved, but it was rather alarming. A paper was read in Chicago at the second ACTH conference on Dec. 8 in which the authors reported using ACTH parenterally for tuberculosis of the larynx where there was marked granulation caus-

ing obstruction. In these cases they found that the effect of ACTH in shrinking the swelling and inflammation in granulation tissue seemed quite beneficial. They did not comment on what happened to the general state, and the follow-up on these cases was not of sufficient length to warrant any conclusion. I think tuberculosis is a definite contraindication to the use of the hormone.

There have been contradictory reports recently on what these hormones do to the coagulability of the blood. A recent paper in the *American Journal of Medicine* states that ACTH increases the coagulability of blood. They cite the danger of thrombophlebitis and pulmonary embolism; however, we have found an increased tendency to bleed from incision, and an increased tendency for nose bleed. As a typical example of this, I cite one of my rheumatoid arthritis cases who was given cortisone. Apparently it effected her immune response, and she got a severe cold, the first one she had had in four years. On blowing her nose she had a terrific nasal hemorrhage which took almost 24 hours to stop. The prothrombin time in these cases is not greatly changed and we do not see any other obvious hematological changes. On the other hand, however, it has been shown that postoperative shock is tremendously decreased. The recent reports on burns treated with ACTH have shown that epithelialization is not diminished as is the healing of fibrous tissue.

Another contraindication to ACTH or cortisone is psychic disturbance. A patient who is mentally on the ragged edge is a very poor risk for these hormones. We have had two very sad cases of arthritis which had had a psychotic episode in the past and who once more went into schizophrenia when cortisone or ACTH were administered.

The dramatic effects of these hormones in many conditions have been so widely accepted that I am adopting what might almost be called a negative approach. There can be no doubt that cortisone and ACTH are here to stay as part of our medical armamentarium. I am merely bringing out some of the things which we must keep in mind and be on the watch for when using these new agents.

Another complication that was seen in four of our patients was a breaking down of peptic ulcer. This does not affect you directly, but it is rather embarrassing to be treating a patient for a relatively minor condition with these hormones and then find that an ulcer, which had previously given few or no symptoms, proceeds to bleed or even perforate. Peptic ulcer is another contraindication to the use of the hormones.

Our experience with local therapy with cortisone has been somewhat limited in its scope. We have been using it particularly in rheumatic diseases. We put cortisone in the joint and we have not had any particular success with the drug locally. It may be that as compound F becomes more available, results will be different. The complications of cortisone therapy are very diverse. Occasionally we think we are seeing a new complication. I saw one a few days ago. Two consecutive patients complained of tinnitus. I thought here is another one! It just so happened that we had an otoscope handy and found impacted cerumen in both cases. We know that the secretion of the sebaceous glands is somewhat increased in many of these patients when we give these drugs. Apparently the increased secretion of wax was sufficient to produce an impaction of cerumen in ear canals that previously had not quite closed.

A practical problem in management aside from these contraindications, and one of the most important, is the manner of economics. We must realize that ACTH and cortisone, although they have been considerably reduced in price, are still very expensive drugs. This should make us pause and reflect on what is going to happen. In a patient with a severe chronic active state of arthritis, we must remember that the maintenance amounts of each one of these hormones is going to cost that patient for the drug alone about \$20 a week over a long period. As yet we do not know how long,—possibly indefinitely like insulin; therefore, we must plan carefully. A psychological and physical let-down inevitably follows the stopping of these hormones. This is so severe that in chronic conditions we are doing the patients harm by giving them a course of the drug and then to stopping it; therefore,

I repeat, the economic consideration must be brought out before starting. I think it is to the credit of Merck & Co. that although in November, 1949, it cost them \$3,000.00 a gram to make cortisone they made it available to investigators at \$300.00 a gram and just charged \$7,000,000.00 to research. Today, just one year later, it sells at \$28.00 a gram. This is American Industry! I think it is a wonderful contribution to medicine and deserving of commendation. Production is increasing and there is plenty of cortisone wherever needed. Cortisone and ACTH have been used for everything from snake bites to burns.

Probably in the field of ear, nose and throat surgery there is a relative lack of conditions where these hormones are really vitally needed. I have given you so many contraindications you probably wonder why you would ever use them. Again, on the credit column of the ledger for these hormones in the various states of rheumatic disease and in the various severe allergies, these drugs have a dramatic effect that has never been seen before, — a marked alleviating effect often within a few hours which is so marked that it has given us a tremendous new enthusiasm in medical research. It is up to us to evaluate these hormones objectively and to know with just what we are dealing. Again I say that cortisone and ACTH are valuable; they are here to stay; they cure practically nothing, but they relieve many conditions. We may have here a substance comparable to insulin in diabetes. Even though it has these marked side effects and many contraindications, when used carefully and in the right conditions it is a wonderful boon and a great advance in medicine.

BOOK REVIEW.

Rehabilitation of Hearing. A Guide to Modern Differential Diagnosis and Treatment of Hearing Disorders. By Victor L. Browd, M.D., Adjunct Professor of Otolaryngology, New York Polyclinic Medical School and Hospital; Associate Otolaryngologist, Midtown Hospital. New York, N. Y. 1951.

Within 38 pages are presented some facts dealing with the anatomy and physiology of the auditory mechanism differential diagnosis and therapy of hearing impairments. It is a clear exposition with several charts and amply illustrated by semidiagrammatic drawings. The author is to be congratulated for his ability to condense so many important subjects into such brief form. There is no doubt that the lectures for which the text forms a basis would be of considerably more interest. W. P. C.

AMERICAN ACADEMY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY.

The 1951-1952 Home Study Courses in the basic sciences related to ophthalmology and otolaryngology, offered as a part of the educational program of the American Academy of Ophthalmology and Otolaryngology, will begin on Sept. 1 and continue for a period of 10 months. Registrations must be completed before Aug. 15. Detailed information and application forms may be secured from Dr. William L. Benedict, the executive secretary-treasurer of the Academy, 100 First Avenue Building, Rochester, Minn.

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June 1, 1951.

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Audivox Model Super 67.

Manufacturer: Audivox, Inc., 259 W. 14th St., New York 11, N. Y.

Aurex Model F and Model H.

Manufacturer: Aurex Corp., 1117 N. Franklin St., Chicago, Ill.

**Beltone Harmony Mono-Pac; Beltone Symphonette; Beltone
Mono-Pac Model M.**

Manufacturer: Beltone Hearing Aid Co., 1450 W. 19th St., Chicago, Ill.

Cleartone Model 500; Cleartone Regency Model.

Manufacturer: American Sound Products, Inc., 2454 S. Michigan Ave., Chicago 16, Ill.

Dahlberg Model D-1.

Manufacturer: The Dahlberg Co., 2730 W. Lake St., Chicago 16, Ill.

Dysonic Model 1.

Manufacturer: Dynamic Hearing Aids, 43 Exchange Pl., New York 5, N. Y.

Electroear Model C.

Manufacturer: American Earphone Co., Inc., 10 East 43rd St., New York 17, N. Y.

Gem Hearing Aid Model V-35; Gem Model V-60.

Manufacturer: Gem Ear Phone Co., Inc., 50 W. 29th St., New York 1, N. Y.

**Maico Atomeer; Maico UE-Atomeer; Maico Quiet Ear Models
G and H Maico.**

Manufacturer: Maico Co., Inc., North Third St., Minneapolis, Minn.

**Mears (Crystal and Magnetic) Aurophone Model 200; 1947—
Mears Aurophone Model 98.**

Manufacturer: Mears Radio Hearing Device Corp., 1 W. 34th St., New York, N. Y.

Micronic Model 101 (Magnetic Receiver); Micronic Model 303; Micronic Star Model. (See Silver Micronic.)

Manufacturer: Micronic Co., 727 Atlantic Ave., Boston 11, Mass.

Microtone T-3 Audiomatic; Microtone T-5 Audiomatic; Microtone Classic Model T9; Microtone Model 45.

Manufacturer: Microtone Co., 4602 Nicollet Ave., Minneapolis 9, Minn.

National Cub Model C; National Standard Model T; National Star Model S; National Ultrathin Model 504; National Vanity Model 506.

Manufacturer: National Hearing Aid Laboratories, 815 S. Hill St., Los Angeles 14, Calif.

Otarion Model E-1S; Otarion Model E-2; Otarion Model E-4; Otarion Models F-1, F-2 and F-3; Otarion Model G-1 (Whisperwate).

Manufacturer: Otarion Hearing Aids, 159 N. Dearborn St., Chicago, Ill.

Paravox Model J (Tiny-Myte); Models VH and VL (Standard); Paravox Model XT (Xtra-Thin); Paravox Model XTS (Xtra-Thin); Paravox Model Y (YM, YC and YC-7) (Veri-Small).

Manufacturer: Paravox, Inc., 2056 E. 4th St., Cleveland, Ohio.

Radioear Permo-Magnetic Multipower; Radioear Permo-Magnetic Uniphone; Radio Ear All Magnetic Model 55; Radioear Model 62 Starlet; Model 72.

Manufacturer: E. A. Myers & Sons, 306 Beverly Rd., Mt. Lebanon, Pittsburgh, Pa.

Rochester Model R-1; Model R-2.

Manufacturer: The Microtone Co., Ford Parkway on the Mississippi, St. Paul 1, Minn.

**Silver Micronic; Silver Micronic (Magnetic and Crystal)
Models 202M and 202C. (See Micronic.)**

Manufacturer: Micronic Corp., 101 Tremont St., Boston 8, Mass.
(See Micronic.)

Silvertone Model 103BM.

Manufacturer: National Hearing Aid Laboratories, 815 S. Hill St., Los Angeles 14, Calif.

Distributor: Sears-Roebuck & Co., 925 S. Homan Ave., Chicago 7, Ill.

Silvertone Model J-92.

Manufacturer: Sears-Roebuck Co., 925 S. Homan Ave., Chicago 7, Ill.

Silvertone Model M-35.

Manufacturer: Micronic Co., 727 Atlantic Ave., Boston 11, Mass.

Distributor: Sears-Roebuck Co., 925 S. Homan Ave., Chicago 7, Ill.

Silvertone Model P-15.

Manufacturer: W. E. Johnston Mfg. Co., 708W. 40th St., Minneapolis, Minn.

Distributor: Sears-Roebuck & Co., 925 S. Homan Ave., Chicago 7, Ill.

Solo-Pak Model 99.

Manufacturer: Solo-Pak Electronics Corp., Linden St., Reading, Mass.

Sonotone Model 600; Sonotone Model 700; Sonotone Model 900; Sonotone Models 910 and 920; Sonotone Model 925; Sonotone Model 940.

Manufacturer: Sonotone Corp., Elmsford, N. Y.

Superfonic Hearing Aid.

Manufacturer: American Sound Products, Inc., 2454 S. Michigan Ave., Chicago, Ill.

Televox Model E.

Manufacturer: Televox Mfg. Co., 117 S. Broad St., Philadelphia 7, Pa.

Telex Model 22; Telex Model 97; Telex Model 99; Telex Model 200; Telex Model 300B; Telex Model 400; Telex Model 1700.

Manufacturer: Telex, Inc., Minneapolis 1, Minn.

Tonamic Model 50.

Manufacturer: Tonamic, Inc., 12 Russell St., Everett 49, Mass.

Tonemaster Model Royal.

Manufacturer: Tonemasters, Inc., 400 S. Washington St., Peoria 2, Ill.

Trimm Vacuum Tube No. 300.

Manufacturer: Trimm, Inc., 400 W. Lake St., Libertyville, Ill.

Unex Model "A"; Unex Midget Model 95; Unex Midget Model 110.

Manufacturer: Nichols & Clark, Hathorne, Mass.

Vacolite Model J.

Manufacturer: Vacolite Co., 3003 N. Henderson St., Dallas 6, Tex.

Western Electric Models 65 and 66.

Manufacturer: Audivox, Inc., successor to Western Electric Hearing Aid Division, 259 W. 14th St., New York 11, N. Y.

Zenith Model 75; Zenith Miniature 75; Zenith Model Royal.

Manufacturer: Zenith Radio Corp., 6001 Dickens Ave., Chicago, Ill.

All of the accepted hearing devices employ vacuum tubes.

Accepted Hearing Aids more than five years old have been omitted from this list for brevity.

TABLE HEARING AIDS.

Aurex (Semi-Portable).

Manufacturer: Aurex Corp., 1117 N. Franklin St., Chicago (10), Ill.

Precision Table Hearing Aid.

Manufacturer: Precision Hearing Aids, 5157 W. Grand Ave., Chicago 39, Ill.

Sonotone Professional Table Set Model 50.

Manufacturer: Sonotone Corp., Elmsford, N. Y.

All of the Accepted hearing devices employ vacuum tubes.

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Meeting: Royal York Hotel, Toronto, Canada, May 18-19, 1952.

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Secretary: Dr. Louis H. Clerf, 1530 Locust St., Philadelphia 2, Pa.
Meeting: Royal York Hotel, Toronto, Canada, May 20-21, 1952.

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President Dr. C. Stewart Nash, 108 Medical Arts Bldg., Rochester, N. Y.
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AMERICAN BOARD OF OTOLARYNGOLOGY.

Meeting: Royal York Hotel, Toronto, Canada, May 13-16, 1952.
Palmer House, Chicago, Ill., Oct. 9-12, 1951.

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Place: Army and Navy Club, Washington, D. C.

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Meeting: Palmer House, Chicago, Ill., Oct. 14-20, 1951.

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OTOSCLEROSIS STUDY GROUP.

Meeting: Palmer House, Chicago, Ill., Saturday, Oct. 13, 1951.

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Pa.
Meeting: Chicago, Ill., Oct. 19, 1951.

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Meeting: Third Pan American Congress of Oto-Rhino-Laryngology and
Broncho-Esophagology.
Time and Place: Havana, Cuba, January, 1952. Dr. Jose Gros. For infor-
mation write Dr. Chevalier L. Jackson, 3401 N. Broad St., Philadelphia
40, Pa.

**SECOND LATIN AMERICAN CONGRESS OF
OTORHINOLARYNGOLOGY AND BRONCHESOPHAGOLOGY.**

Time and Place: Sao Paulo, Brazil, July, 1951.
President: Professor A. dePaula Santos.
Secretaries: Dr. Jose de Rezende Barbosa, Dr. Plinio de Mattos Barretto,
Hospital das Clinicas, Sao Paulo, Brazil.

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Meeting: Royal York Hotel, Toronto, Canada, May 22-24, 1952.

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Secretary of Section on Ophthalmology: Dr. Carroll McCoy.
Chairman of Section on Otolaryngology: Dr. Howard P. House.
Secretary of Section on Otolaryngology: Dr. Edwin Scobee.
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Blvd., Los Angeles, Calif.
Time: 6:00 P.M., fourth Monday of each month from September to May,
inclusive.

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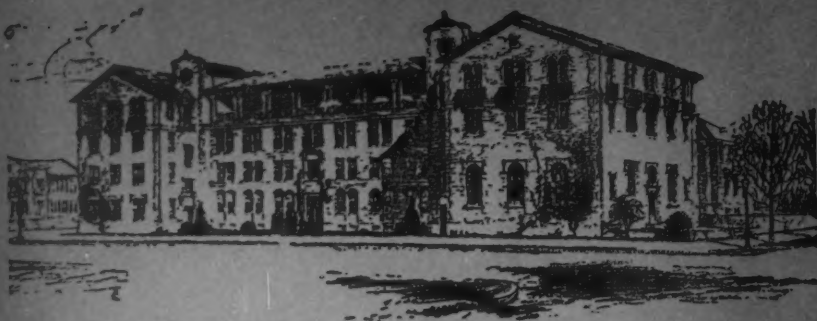
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CONTENTS

PRESIDENT'S ADDRESS. Louis H. Clerf, M.D., Philadelphia, Pa.	483
SYMPOSIUM: CARCINOMA OF THE LARYNX.	
I — THE SURGICAL TREATMENT OF EARLY CARCINOMA OF THE LARYNX. Francis E. LeJeune, M.D., New Orleans, La.	488
II — TREATMENT OF EXTENSIVE CARCINOMA OF THE LARYNX. Henry B. Orton, M.D., Newark, N. J.	496
III — ROENTGEN THERAPY OF CARCINOMA OF THE ENDOLARYNX. J. A. del Regato, M.D. (by invitation), Colorado Springs, Colo.	511
IV — CANCER OF THE LARYNX. FIVE-YEAR RESULTS. LeRoy A. Schall, M.D., Boston, Mass.	517
V — SUMMARY OF CANCER OF THE LARYNX SYMPOSIUM. Gordon B. New, M.D., Rochester, Minn.	523
EXPERIENCES WITH PARENTERAL VITAMIN A THERAPY IN DEAFNESS AND TINNITUS. Shirley Harold Baron, M.D., San Francisco, Calif.	530
BULBAR POLIOMYELITIS: A RESPIRATORY PROBLEM. T. C. Galloway, M.D., and John Elsen, M.D., Evanston, Ill.	548
PRACTICAL PROBLEMS IN THE USE OF CORTISONE AND ACTH. Joseph Lee Hollander, M.D. (by invitation), Philadelphia, Pa.	565
BOOK REVIEW	572
HEARING AIDS ACCEPTED BY THE COUNCIL ON PHYSICAL MEDICINE OF THE AMERICAN MEDICAL ASSOCIATION	573
DIRECTORY OF OTOLARYNGOLOGIC SOCIETIES	577

